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TRANSACTIONS

OF THE

Odontological Society of Great Britain.



VOL. XVI.—NEW SERIES.

TRANSACTIONS
OF THE
ODONTOLOGICAL SOCIETY
OF
GREAT BRITAIN.



VOLUME XVI.—NEW SERIES.

LONDON:

Printed and Published for the Society by
HARRISON AND SONS, ST. MARTIN'S LANE, W.C.,
PRINTERS IN ORDINARY TO HER MAJESTY.

1884.

HARRISON AND SONS,
PRINTERS IN ORDINARY TO HER MAJESTY,
ST. MARTIN'S LANE.

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Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

November 5th, 1883.

DR. JOSEPH WALKER, PRESIDENT, IN THE CHAIR.

On taking his seat, the PRESIDENT said he was glad to see so good an attendance of members, and trusted they had come prepared to enter upon the work of a new session with renewed vigour after the recess. He should be glad to see a larger proportion of the members taking an active part in the proceedings; it would add much to the life of the Society's meetings if the members generally were more willing to take their share in the discussions on the casual communications and the paper of the evening.

The Minutes of the previous meeting having been read and confirmed,

The PRESIDENT called upon the Curator to exhibit the chief additions which had been made to the museum since the last meeting of the Society.

MR. S. J. HUTCHINSON said that, before enumerating the specimens he had to show, he would take the opportunity of stating that, with the assistance of Messrs. Henri and Willoughby Weiss, he had arranged the Comparative Anatomy series in the old library, and hoped to issue the supplemental catalogue in January.

Owing to the length of time which had elapsed since the last meeting of the Society, he had rather a long list of donations to the museum to bring before the notice of the members.

In the first place, he would hand round a specimen of considerable historical as well as antiquarian interest, which had been contributed by Mr. John H. Parkinson, M.R.C.S., of Porchester Square. It was a partial denture worn by Queen Caroline at the time of her trial, and consisted of the upper incisors and canines mounted on a piece of flattened gold wire; it had been secured to the contiguous teeth by clasps at each end. It had been made in Italy, and was certainly a great curiosity.

In the next place, he would call attention to a Maori skull, sent by Mr. Arthur Hoby, L.D.S.I., of Wellington, New Zealand. It would be noticed that the Maori had suffered extensively from caries and loss of teeth; there was also a carious abscess cavity in the bone at the root of the right canine.

Mr. Willson, of Manchester, has sent models of a case of an extraordinarily-shaped supernumerary tooth, which had erupted between the centrals; these were normal in shape, but irregular in position. Mr. Willson had kindly sent the extracted tooth as well.

Mr. Jas. Bate, of Tiverton, had sent models of a very curious case of abnormal dentition. There was excessive tooth development in place of two of the lower incisors, which were like three teeth united into one three-cornered tooth; whilst in the upper jaw the laterals were altogether absent.

Mr. J. H. Whatford, of Eastbourne, had forwarded models of the mouth of a young man, aged nineteen, showing complete absence of all the lower incisors. It was stated that the patient had never had any temporary lower incisors, and that the upper laterals of the same set had also failed to make their appearance. There was no history of any accident or of any family peculiarity.

Mr. A. B. Alexander, of Bedford Place, had contributed two fossil shark's teeth; very good specimens.

Mr. Chas. Foran, of Eastbourne, had contributed a model of a seal impressed with the marks of the upper incisor teeth, and had sent with it the following extract from a standard

work on this subject, in which an explanation of this very curious mode of confirming legal documents was given.

“Extract from *Sigilla Antiqua*; 2nd Series. Engravings from Ancient Seals attached to documents in the Muniment Room of Sir Thos. Hare, Bart., of Stowe Bardulph: 1862.

“Plate I.—The impression of the teeth on the wax, in place of seal, of Agnes, the daughter of Agnes, the daughter of William Fitz, of Fyncham, to a deed by which she enfeoffs Adam de Fyncham in one acre and three roods of land there (without date, temp. Edward II, 1307 to 1327).”

Note in Appendix to above:—“It has been said that ‘*before the use of seals in England, divers writings had the wax of them bitten with wang* tooth of him that passed them.*’ (Verstagan.)”

“*In witness of the sothe,
Ich hav bitten this wax with my wang tothe.*”

“What amount of truth there may be in this assertion I pretend not to say. We have here, however, at a later period, an example, in which for lack of seal, the fair Agnes has sharply impressed the form of her teeth upon the wax.

“Mr. Lower, in his ‘*Curiosities of Heraldry*,’ gives what purports to be a rhyming title-deed, formerly in the possession of the Rawdon family, which ends thus:

“‘*And in token that this thing is sooth,
I bit the whyt wax with my tooth.*’

“At the head of an emblazoned pedigree of Rawdon, certified by Sir John Bowulph, Garter, this supposed grant is given, but with some variations, and without any reference to biting the wax.”

From Mr. Henry Sewill he had received a specimen showing absorption of a permanent tooth in a patient aged fifty-seven.

MR. HUTCHINSON then handed round models of the mouth of a patient who had been sent to him by Dr. Gowers, at University College Hospital. The patient, aged twenty-seven,

* “Wangs, wang teeth, the cheek or jaw teeth, or dog teeth.—Chaucer.” (Bailey’s Dictionary.)

was a confirmed epileptic, had webbed fingers, no lobes to her ears, and had congenital dislocation of both elbows. Her dentition was as follows:—In the lower jaw she had five teeth; in the upper only two teeth, and the roots of the first molar, but the right central seemed to be just making its appearance.

Lastly, he would bring forward a specimen which would probably interest Mr. Coleman. It was a bicuspid tooth, which had been *cracked* through the crown into the pulp cavity. The accident occurred merely from biting on a fragment of bone in a risole. The patient, a lady, suffered from very severe neuralgia for a fortnight afterwards, and then applied to him for relief. As she had once before met with a similar accident, he examined the tooth very carefully, and finding the crack, at once extracted it. The patient was at once completely relieved of her neuralgia.

MR. J. S. TURNER showed a second right upper bicuspid with remarkably stunted roots; what root there was was healthy: there had been no absorption. The patient from whose mouth it was taken had an unusually good set of teeth—small, but very regular, and this was the only one that was decayed. As she would not submit to have it stopped, Mr. Turner extracted it,—the tooth, of course, coming away with unexpected ease.

MR. STORER BENNETT presented to the museum a model of the upper jaw of a man, aged twenty-four, in whom the second molars were erupted considerably external to the rest of the series, whilst the wisdom teeth, which were semi-lunar in shape, were placed against their posterior and internal surfaces, to which they appeared to have been closely moulded. The right wisdom tooth had been extracted in consequence of pain, and was given with the model.

He also presented a series of models taken from a girl, aged ten, and her two brothers, aged respectively eleven and twelve years. In the eldest and youngest children the upper incisors were extremely protruded, and in the other case they were so to a more limited extent. The cases were interesting as examples of hereditary influence exerted on three children

whose maternal grandfather suffered from a similar condition, but whose parents were themselves free from the deformity; the disease thus missing one generation but appearing in the next.

MR. W. A. HUNT, of Yeovil, exhibited a lower wisdom tooth, one of the roots of which was perforated not far from the apex, and read the following description of the case:—

“In a paper read by me at Plymouth in August last, on ‘Neuralgia,’ I pointed out the great liability of irritation of the inferior dental nerve, as evidenced by pain in the ear, the lower front teeth, &c., from diseased wisdom teeth; and that this is easily accounted for by the anatomical fact that the wisdom tooth lies much closer to the nerve trunk than any other tooth. I stated that the root of the wisdom tooth was grooved sometimes by the trunk nerve, and that Mr. C. Tomes had shown me a lower wisdom tooth the fang of which was tunnelled, and the trunk nerve actually passed through. On extraction the nerve of course was ruptured, and this was followed by loss of sensation in the parts supplied by the nerve. To-night I bring under your notice an under wisdom tooth which I extracted a few days ago, which has three roots. The anterior and external root, not far from its apex, is tunnelled, but in this case I have reason to think that this tunnel transmitted an important, though abnormal, branch of the inferior dental artery. The patient bled freely for an unusually long time, and I therefore examined the mouth; the bleeding was arterial, and came freely *per saltum*. This made me examine the tooth; I found the tunnel, conjectured that an artery passed through which was ruptured by extraction, and I therefore put a small dry wool plug into the corresponding socket only: the bleeding was instantly controlled.”

Mr. Hunt also showed a first right upper molar, from the apical foramen of the palatal root of which a remarkable foreign body projected, and read the following notes of the case:—

“The patient, a lad aged thirteen, came to me suffering much

pain, which he referred to the right first upper molar. The tooth was dead, was affected with periostitis, and the teeth were very crowded. I therefore extracted it. Projecting some distance from the end of the palatal fang I found, emerging from the foramen, a piece of square indiarubber, just such material as projects when the elastics of spring-side boots get worn and shabby. It seems this tooth had been stopped by somebody at Clapham eighteen months before, and had been perfectly comfortable until within two weeks of his coming to me. I have carefully avoided meddling in any way with the tooth: it is just as I extracted it. It will be noticed that apparently no access has been made by any cutting tool to the nerve chamber. I would like to know how any man could possibly get such a difficult thing as indiarubber up such a place; and if he could, it would be physically impossible to pass so large a thing through the apical foramen. Now mark one other point; some affirm that *pressure* is a very small factor in causing absorption. Look then carefully at this apical foramen; it is not small and round, but under the pressure of the rubber absorption has clearly taken place, so that the foramen is large and *square*, exactly as the rubber. Must not this indiarubber have been auto-locomotive, and if so, by what agency was this movement carried on?"

MR. COLEMAN remarked, with reference to what Mr. Hunt had said about absorption in dead teeth, that although the tooth pulp might be dead and the dentine also, still the cementum retains its vitality, and absorption may take place by its instrumentality.

MR. BOWMAN MACLEOD, of Edinburgh, then exhibited an artificial obturator and nose support, which he had made for a case in which extensive destruction of the nasal bones and palate had taken place as the result of syphilis, and showed also models of the case.

The patient, a girl eighteen years of age, was sent to Mr. Macleod, at the Edinburgh Dental Hospital, by Dr. McLaren, of the Lock Hospital. The destruction of tissue involved the whole of the hard palate and the bones of the nasal cavity; the

nose lay flat upon the face, and the patient's speech was quite incomprehensible. Mr. Macleod accordingly made her an obturator of black vulcanite, carrying a few artificial teeth, and a support for the nose, also of black vulcanite with a septum of dental alloy. The patient had worn this appliance since February, and had derived the greatest comfort from it; she now spoke quite clearly.

Mr. Macleod added that he had exhibited the patient at the Annual Meeting of the Odonto-Chirurgical Society at Edinburgh, in March last, and a full account of the case, with a description of the way in which he obtained accurate models of the parts and made the piece from them, both of which operations involved a considerable amount of thought and trouble, would be found in the published Transactions of that Society for the month named.

The PRESIDENT said that having seen the patient wearing this appliance at the meeting of the Odonto-Chirurgical Society, he was very much struck with the skill displayed in its adaptation to the case, and he begged Mr. Macleod to exhibit it to the Odontological Society on the first convenient opportunity. He considered it quite a work of art.

MR. CAMPBELL (Dundee) said he had also been present at the meeting in Edinburgh, and had seen the piece fitted. He could vouch for the wonderful improvement it effected in the patient's appearance and speech.

MR. MACLEOD then gave the following particulars of a very remarkable case of symmetrical exfoliation of a considerable portion of the alveolar processes with the lateral walls and floor of the antrum on both sides of the mouth, and showed the plate which he had made to remedy the loss of these parts.

"John Cheyne, age forty-five, boiler-rivetter, came to the Edinburgh Dental Hospital for advice and assistance, March 29th, 1883. He complained that he could neither eat nor drink, as the act of swallowing projected the contents of the mouth through the nose, instead of down the gullet. His articulation was also very much impaired.

"On examination I found that the alveoli, on both sides, as far forward as and including the bicuspid, together with the floor and lateral walls of the antra, were wanting, leaving the oral and nasal cavities patent to one another.

"No history of syphilis could be obtained either from the patient himself or his medical attendant. He was, however, a hard and habitual drinker, and about two months before coming to the hospital he had, as the result of sleeping out while on a drinking bout, caught a cold. His teeth got loose and matter began to ooze into his mouth, and the fœtor of his breath was such that he was intolerable to himself and all around him. The doctor, intending to remove the teeth one by one, found, much to his surprise, that the alveoli and antral walls came away with the teeth embedded in them. The stench was so disagreeable that he consigned the pieces at once to the flames, and, as he says, could not get his nose free of the stench for days afterwards.

"When the patient presented himself to me, the surfaces were healthy, and I made a vulcanite plate covering the entire palate, with lugs fitting into the cavities, and lips projecting beyond the buccal margins; this plate carried the missing teeth. This made an air-tight partition, and restored the lost functions. Immediately on its insertion he ate and drank with comfort, and spoke with distinctness. I am sorry to say, however, that he did not long enjoy its use. Three weeks after his return home he succumbed to the effects of pyemia and hard drinking."

MR. HENRY SEWILL related a case of cataract of the right eye, probably due to dental irritation. The patient was a middle-aged lady, unmarried, and of nervous temperament, who had suffered all her life from bad teeth, and at times from neuralgia. About two years and a half ago her eyes began to be uncomfortable; she was troubled with pricking and smarting in them. In January, 1882, contraction of the muscles of the right side of the face came on, and she began to suffer from neuralgic pain on that side. In July of that year drooping of the right eyelid came on suddenly, and she

discovered that she had lost the sight of her right eye. She then consulted several medical men, amongst others Dr. W. Hoffmeister, of Cowes, who, finding that her teeth were in a very bad state, suspected that they might be the cause of her ailments, and strongly advised her to have them attended to, but the patient refused.

In July, 1883, she came to Dr. Ferrier, who found her suffering from spasm, or contraction of the muscles of the right side of her face, with local hyperæsthesia; she complained also of neuralgia of that side of the face, and of inability to open the right eye, though she could do this with an effort. This closure was found to be due to spasm of the orbicularis muscle. The lens of the right eye was almost opaque. Finding that her teeth were in a very neglected state, and believing that this was the cause of her neuralgia, and probably also of her cataract, Dr. Ferrier insisted that she should consult a dentist.

She accordingly consulted Mr. Sewill, who found in the upper jaw the right canine broken down level with the gum, four front teeth and some roots covered with tartar, and a vulcanite plate, also encrusted with tartar, which had not been removed from the mouth for several years. The gums were inflamed and tender, all the teeth having evidently been the centres of long-standing inflammation. In the lower jaw there were ten teeth, also coated with an enormous mass of tartar.

Mr. Sewill extracted the upper teeth, at the same time gradually removing the tartar from the lower teeth, and generally getting the mouth into a healthy state; the patient was then supplied with an upper set of artificial teeth. The result of this treatment was that the spasm of the facial muscles subsided, she was able to open the eye, and she lost the neuralgia. Her general health was also greatly improved, but there was no improvement in the sight of the eye.

Mr. Sewill added that this was the first case of disease of the eye due to dental irritation which he had yet met with in the course of his experience. Dr. Ferrier had taken great pains to eliminate all other possible causes before arriving at

his diagnosis, and confirmed as this was by the result of the treatment, he (Mr. Sewill) thought there could be but little doubt of its correctness.

The PRESIDENT then called upon Mr. Henry Power, F.R.C.S., to read the paper of the evening.

*On the Relations between Dental Lesions and
Diseases of the Eye.*

BY HENRY POWER, M.B. Lond., F.R.C.S., Ophthalmic Surgeon
at St. Bartholomew's Hospital, and Surgeon to the
Royal Westminster Ophthalmic Hospital, &c.

THE connection between dental disease and affections of the eye is not at first sight very apparent, but it has been noticed, though for the most part only casually, by many writers. I have thought that it might interest this Society, and might at the same time be serviceable to those who are engaged in ophthalmic practice, if I attempted to collect some of the evidence which seems to demonstrate that dental disease may excite various ophthalmic affections; that it might also be the means of eliciting valuable hints from those who are engaged in dental surgery, and that it might afford an opportunity for the citation of cases which, though exceedingly interesting when considered in connection with others of the same nature, may not have been regarded by those in whose experience they have occurred as of sufficient importance to merit reporting.

I have taken some trouble in looking through

the treatises of those authors who have written in the course of the last hundred years, and I think it may be said that the connection between dental and ophthalmic disease has not been specially dwelt upon in this country before the year 1824. Beer, indeed, before this spoke of a consensual affection of the eye which might occasionally be due to carious back teeth; but no mention is made of the teeth by Ware or by Chandler, who both wrote in 1780, nor by Scarpa, whose treatise was translated by Briggs in 1806, nor by Weller in 1821. Scarpa, indeed, in his account of ptosis, states that it may be produced by indigestion and gastric disease, and by the presence of worms; and in speaking of amaurosis holds that it may result from contusion and laceration of the supra-orbital nerve.*

Weller (1821), in like manner, who copied the great German oculist Beer, though he does not allude to the teeth, and of course does not speak of reflex actions, yet recognises this class of affections when he refers various forms of amaurosis to sudden suppression of lactation and acute cutaneous affections, and to loaded bowels, whilst he elsewhere refers strabismus and blepharospasm to worms in the intestinal canal. The first writers I have met with who distinctly refer to the teeth are Travers, who speaks of strabismus caused by difficult denti-

* Scarpa (p. 511) gives many cases of reflex amaurosis.

tion, and Frick, who, in 1826, speaking of the causes of strabismus, remarks that it is "often concomitant with difficult dentition;" whilst Welbank, who translated Frick's book, in a note on the treatment of amaurosis, states that he has obtained good results from the employment of carbonate of iron in cases of amaurosis "proceeding from disease of the dental nerves."

After this period, difficult dentition and dental disease are often mentioned incidentally amongst other causes of ophthalmic disease.

I presume that you will all accept as a fact, that which is admitted by all ophthalmic surgeons, that there is such an affection as reflex or sympathetic ophthalmia, that is to say, that irritation of one set of branches of the fifth will affect those of the opposite side; yet in discussing the subject before us it seems to me in the first place important that I should very briefly put before you the evidence showing that reflex irritation of the eye really occurs. If any ophthalmic surgeon be asked why he believes in reflex irritation of the globe and its appendages, his mind at once reverts to many cases in which injury to one eye, especially of the ciliary region, has been followed, after a period of very variable duration, by inflammation of the uninjured eye of a low but steadily progressive type, generally involving all the tissues, and leading to more or less serious impairment, or even to complete loss, of vision.

I could give many cases from my own experience. I will limit myself to two.

A young man presented himself to me at St. Bartholomew's Hospital, Chatham, saying he had been struck with a piece of the head of a chisel on the eye. His vision had previously been perfect. On examination there was a wound in the cornea, a rent in the iris, blood in the anterior chamber, and traumatic cataract. He could see light, and the shadow of the hand. I had no doubt that a fragment of metal was in his eye, and that practically the eye was lost. I recommended its removal. He declined. A week after, perception of light still remaining, he again declined to have anything done. Soothing remedies were employed. About six weeks later he came with the opposite eye sharply inflamed; there was dimness of vision and general inflammation of the globe. He was now anxious to have the eye originally damaged, from which he had suffered a martyrdom, removed. I did that operation, but it was too late; the inflammation ran its course in spite of careful treatment, and he lost the sight of both eyes. That is the usual result.

A second case. Two lads sitting at the same desk. One presents a steel pen to the eye of the other, when his head is averted, and calls his name; he turns his head to the speaker, and the nib of the pen makes a punctured wound at the

outer border of the cornea. A slight protrusion of the iris takes place. He continues his work, with gradually increasing irritation in the damaged eye, for three weeks, when suddenly vision in the second eye commences to be impaired. He is unable to accommodate his eye for near objects, and iritis sets in. The gravest anxiety is felt that total loss of vision will ensue, but fortunately this result was averted; by keeping the lad in perfect darkness for a month, and by appropriate local and general treatment, the reflex or sympathetic irritation gradually subsided, and by a singular piece of good fortune the injured eye also quieted down, and absolutely perfect vision was recovered in both eyes. This is an unusual result of sympathetic ophthalmia.

It is, however, by no means necessary that irritation, even when it is very severe on one side, should necessarily radiate to the opposite eye, or to other nerves.

Curious cases sometimes occur, and it is as difficult to say why inflammation does arise in one case as it is why it does not occur in another.

About 1870 a man presented himself to me at the same clinic with severe injury of the eye, also from a piece of iron broken off the head of a rivet: the eye was laid open by the fragment, and vision was lost. I recommended removal of the globe. The man declined. He went to Maidstone. The

surgeon—I believe, Mr. Adams—gave him, he said, the same advice, but he was determined not to have it done. He recommenced his work, and the eye gradually quieted down, but from time to time he suffered severe pain in it, and had to discontinue work for some days ; still the other eye remained strong. About two months ago, however, he called at the hospital, and he then had conjunctivitis and some impairment of vision in the healthy eye, whilst the opposite one was tender and painful. I exhorted him to have it removed. He reluctantly, and only after a week or two of deliberation, consented. In the operation for removal I met with a difficulty. After dividing the conjunctiva and muscles, I introduced a pair of scissors, but was unable to divide the optic nerve. Larger and longer scissors were tried, and it was only after considerable trouble that the globe was enucleated. The reason of the difficulty immediately appeared, for a large piece of metal was embedded in the optic nerve, just where it might be expected that it would excite sympathetic ophthalmia, yet where it had remained for twelve years, with but slight effect on the opposite eye ; for he made a good recovery, and was discharged on the 17th October, 1883, and has had no trouble since.

If the question be put, How does the irritation or inflammation of one eye come to affect the other—by what path, or paths, does the irritation travel ?

the reply given, both by exact clinical observation and by pathological investigation, is that in the vast majority of cases there is a neuritis which travels along the ciliary nerves, but in a few instances along the optic nerves, and we shall see that this conduction of the morbid process along the sheaths of the nerve is of considerable importance in enabling some explanation to be given of the occurrence of reflex troubles where the teeth are the seat of the primary lesion.

Injuries affecting the branches of the first division of the fifth pair are well known to affect the eye of the same side, and there are good reasons also for believing that affections of other branches of the fifth pair of nerves may be the cause of ophthalmic troubles.

In 1853, M. Decaisne, staff surgeon of the Belgian army, presented to the Academie de Belgique,* under the title of "Sur les dents œillières," a note on the disturbances of vision consequent on alterations of the teeth, in which he states that he saw an officer struck on the forehead with a piece of wood in the course of the frontal nerve, which caused complete blindness, and then remarks that it is not uncommon to see diplopia, or even complete loss of vision, supervene, either with or without ulceration of the

* "Bull. de l'Acad. Med. Belg., T. XIII, 1853, and "Archiv. Med. Mil.," 1854.

cornea, as a result of disease of the maxillary sinus.

That injuries to the supra-orbital nerve are occasionally followed by amaurosis seems to be well established. A case is recorded by Valsalva* of similar damage in which recovery is stated to have taken place. Unfortunately, however, in these cases the older authors had no means of knowing whether the deeper structures of the eye were injured or not. Some of the cases recorded might well have been accompanied by dislocation of the lens, by hæmorrhage in or detachment of the retina, by crushing of the optic nerve in the optic foramen, and by other conditions which the invention of the ophthalmoscope would now enable us readily to diagnose, and which can in no way be regarded as of a reflex nature. In one case, for example, the patient was thrown out of a wagon, and in another severely pecked by a turkey-cock. Severe blows and cuts over the brow and cheek may easily produce blindness by intra-ocular mischief, without causing any apparent damage to the surface of the eye. Thus Nossit† reports a case where a peasant was struck by a knife which cut the brow. M. Nicaise‡ states that he has on various occasions noticed the coincidence that exists

* "Dissert.," II and XI.

† Himly, i, 89.

‡ Gaz. Med. de Paris," 1871, p. 150.

between affections of the nasal fossæ and those of the eye. He believes he has thus been able to recognise a connection between the occurrence of nasal polypi and glaucoma, attributable to irritation of the many branches of the fifth pair which are distributed to the mucous membrane lining the nasal cavity. Demours* gives a case of amaurosis supervening after extirpation, *secundum artem*, of a sebaceous cyst of the size of a hazel-nut; the same evening inflammation of the eye supervened, and the next morning the eye was lost.

In 1870, M. Delestre published an essay on accidents following extraction of the teeth, and reports several cases which tend to prove the existence of visual troubles. He remarks that odontalgia is often accompanied with weeping and redness of the conjunctiva, with sudden darts of pain, and winking of the lids. He considers that there is at first irritation of the branch of the dentary nerve supplying the affected tooth, and which is therefore one of the branches of the superior or of the inferior maxillary nerve. This irritation of one part of the fifth extends to other parts of the fifth, and particularly to the ophthalmic, which leads to lachrymation, and redness of the conjunctiva.

That the teeth and the eye may be concomitantly affected as the result of some widespread

* T. I, p. 173.

and general disease of the system, as in syphilis, Mr. Hutchinson's observations have made abundantly clear, though there is little doubt that some cases closely resembling those which he has so well and carefully described are the result of other conditions of the system than those appertaining to syphilis; at all events, they occur in children in whom no evidence of syphilis can be obtained from either parent.

I apprehend, however, that this is not exactly included in the subject on which I am about to speak to-night. My object is rather to bring before you some evidence of the occurrence of ophthalmic affections as a consequence of dental disease. And the grand difficulty that I have met with in drawing any definite conclusions, is the extreme frequency with which dental affections present themselves. Thus, to take one affection alone, I was desirous of ascertaining whether dental caries and phlyctenular ulcer of the cornea stood to each other in the relation of cause to effect; but on examining the teeth of my young patients with phlyctenulæ, I found they all had carious teeth. It might be said, Is not that evidence that there is a close relation between the two affections? but, unfortunately for this view, the disease can readily be cured—in many instances—by the means usually adopted in ophthalmic practice without the extraction of the offending

teeth, so that they only fulfil half the old adage constituting *a vera causa*, "*præsens morbum facit, sublata tollit.*"

Having, however, established the existence of reflex irritation of the eye, it will perhaps be the best mode of treating of the various modes in which that irritation may express itself, if we consider it under the three following heads:—

1. Reflex irritation affecting striated and unstriated muscle.
2. Reflex irritation affecting the mucous membrane and cornea.
3. Reflex irritation affecting the optic nerve and retina, and intra-ocular tissues.

In regard to reflex irritation affecting muscular tissues, we may mention—

1. Paresis of the ciliary muscle.
2. Paresis of the intra-orbital muscle.
3. Paresis of the muscular fibres of the iris.
4. Paresis of one of the ocular muscles.
5. Paresis of the orbicularis palpebrarum muscle.

One of the commonest forms of visual disturbance, induced by dental disease, is *loss or failure of the power of accommodation*. By power of accommodation is meant the faculty which the eye possesses of adjusting its refraction so that well-defined images of objects situated at different distances from the eye may be formed upon the retina. This is accomplished, as is now well

known, by the action of the ciliary muscle, which, by contracting, causes the lens to become thicker. For the lens is normally and, when the eye is at rest, covered anteriorly, and flattened by the anterior capsule, which is stretched by the suspensory ligament; but when near objects are fixed, the ciliary muscle is brought into play. This brings forward the anterior part of the choroid, and relaxes the suspensory ligament, and the lens immediately, by virtue of its own elasticity, becomes thicker, and is thus rendered capable of focussing divergent rays—that is to say, rays proceeding from near objects. The stronger the muscle, and the more elastic the lens, the greater is the degree of accommodation which can be effected; for, under these circumstances, the suspensory ligament can be thoroughly relaxed, and the lens can become highly convex. Hence accommodation is strong, or has a great range, in children, extending from infinite distance to a point not more than three or four inches from the eye; for in them the ciliary muscle has great power, and the lens is very elastic. In advanced age, on the contrary, the muscle becomes feebler, and the lens is of firmer consistence and much less elastic. The suspensory ligament, consequently, does not undergo much relaxation, and the lens does not swell when the compressing influence of the anterior capsule is withdrawn. Hence the range

of accommodation diminishes : distant objects, from which parallel, or approximately parallel, rays proceed, are still accurately focussed upon the retina ; but any small object, to be clearly seen, must be held at a distance of 10 to 12 or 18 inches from the eye.

The influence of dental lesions on the accommodation has been particularly investigated by Dr. Hermann Schmidt, of Berlin. This observer examined the eyes of ninety-two patients, who presented themselves at his clinic, suffering from some form of dental disease—such, for example, as caries, periostitis, or neuralgia. Considerable pains were taken to determine the range of accommodation in both eyes, and to compare that on the sound with that on the unsound side ; whilst reference was made to the tables of averages for each eye given by Donders. Amongst the ninety-two cases, Schmidt found there were only nineteen cases in which the range of accommodation was normal, or better than normal ; in the remaining seventy-three cases the range was lowered, and in most instances considerably reduced.

In unilateral odontalgia, the range of accommodation was reduced on the same side in thirty cases. In fifty-one cases there was no difference in the diminution of the range of accommodation perceptible. In one case, the eye of the side opposite to the unsound teeth was the weaker of the two.

In nine cases the teeth were carious on both sides. It appeared further that the influence of dental lesions on the accommodation was more frequent, the younger the patient; the ages between ten and twenty being those in which the paresis was most marked. After thirty years of age the impairment of the power of accommodation was much less frequently observed.

The influence of sex was not noticeable.

In regard to the locality of the dental lesion; in forty-one cases in which the upper maxilla was affected, paresis of accommodation was observed seventeen times. In thirty-nine cases in which the lower jaw was affected, the paresis was observed nineteen times. Disease of the teeth of the lower jaw, therefore, appeared to be somewhat more effective in producing failure of accommodation than that of the upper jaw. Disease of the incisors, and of the first, third, and fifth back teeth, using the German mode of notation, appeared to be more frequently associated with the ocular disturbance than lesion of the canines, or of the second and fourth back teeth.

The nature of the dental lesion appeared to be of little importance, great impairment of accommodation accompanying comparatively slight disease, whilst extensive disease of the teeth, accompanied by severe pain, was associated in

some instances with only slight paresis of accommodation.

Dental lesions appeared to have no effect upon the sharpness of vision.

The impairment of the power of accommodation was only rarely noticed by the patients themselves, which perhaps might be in part attributable to the circumstance that in most cases, if the patients were suffering much pain, the ordinary avocations were suspended.

The explanation of this remarkable effect of dental lesion is not quite clear. Two views may, it appears to me, be taken of it. We may regard it as of a reflex character, and as being analogous to that weakness or paralysis of certain muscles observed in some of the reflex paralyses of infancy, and which we may consider to be of the nature of an inhibitory influence, since they rapidly supervene and rapidly vanish ; or we may regard it as a simple result of the generally lowered tone of the system, consequent on the depressing influence exerted by the dental lesion. I need hardly dwell in this place, and before such an audience, on the extraordinarily powerful effect on the nervo-muscular and circulatory systems of prolonged toothache, or how the impairment of the digestive functions, the sleeplessness, and general feeling of malaise, lower the tone of the nervous system, and produce indisposition for all kinds of mental

and bodily exertion. There can be little doubt that the sympathetic nervous system and the unstriated muscles participate in this depression ; and we can easily understand how there is a corresponding diminution in the power of the ciliary muscle, and failure of accommodation.

Schmidt himself advances a very different explanation. He believes that in these cases a reflex stimulation of the vaso-motor nerves takes place, leading to increased intra-ocular pressure, and consequently to impairment of the power of accommodation. But when Schmidt's paper was written the action of the vaso-motor nerves was less known than at present. And such reflex stimulation would seem calculated to lead to a diminution, rather than to an increase, of intra-ocular tension.

To enable us to speak quite positively upon the influence of carious or painful teeth upon the accommodation we require information that is very rarely attainable. We ought to know that the accommodation was thoroughly good before the teeth were affected, that the failure of accommodation occurred simultaneously, or soon after the dental lesion ; and, finally, that after the removal of teeth, recovery of the accommodation power takes place.

In the majority of cases we must rely upon the patient's word for the first of these factors of our

judgment; and in regard to the second, so many persons of both sexes, and all ages, are affected with dental disease that if this be a *vera causa*, good accommodation would be the possession of only a favoured few; whilst lastly, even Schmidt, who paid particular attention to the subject, was only able to examine eight cases, out of nearly a hundred, after the extraction of the offending tooth or teeth. In five of these, however, distinct improvement was observed. The diminution in the power of accommodation was in each case characterised by the recession of the near point, whilst the far point remained unaltered. After extraction of the affected teeth the near point approximated to the eye.

Another class of cases in which a reflex influence appears to be exerted upon muscular tissue is that in which the muscular tissue of the iris is affected. This condition is termed *iridoplegia*, or *mydriasis*. In it the pupil is widely dilated and motionless, owing, as is generally believed, to paralysis of the sphincter pupillæ, which is supplied by the ciliary nerves containing branches of the third nerve; but it is possible that it may be due to contraction of the dilatator iridis, if such a muscle really exists, and this might be produced either by irritation of the branches of the sympathetic or of the fifth pair, which Bilogh believes supply it.*

* Wecker, i, 407.

It is remarkable and suggestive of its mode of origin that mydriasis rarely if ever occurs simultaneously on both sides, and in many cases that I have seen in past years I have scarcely ever been able to trace the ætiology, though I must admit that I have not paid special attention to the teeth. It is instructive to find that in one case recorded by Desmarres, a cure was effected by the extraction of a carious molar, and in future I shall certainly, in any case of the kind that may present itself, make a careful examination of the teeth.

In the cases that have fallen under my care the dilatation of the pupil has been permanent, which points rather to some organic lesion, such as might be produced by neuritis, than to any inhibitory influence.

One case, and so far as I know one case only, of *exophthalmia* has been placed on record. It is contained in a recent number of the "Recueil d'Ophthalmologie" of Galezowski, 1882, p. 441, and is reported by Weinberg. The chief facts of the case are that a widow presented herself in the out-patient department with an *exophthalmia*, accompanied by severe pain of the right eye. She had suffered for thirty-five years from epileptic vertigo and cramp of the stomach. In the month of March of last year she had an attack of phlebitis of the left femoral vein, and on examination she had varices in this leg, and some œdema of the left

leg. For five weeks previously she had experienced noises in the right ear, with fronto-temporal cephalalgia of the same side and pricking sensations of the eye, which lost its normal aspect, and she had intermittent sleeplessness. The pricking sensations gave place to lancinating pain, the eye reddened, and the bulbar conjunctiva was strongly injected. For four days previous to her appearance the vision had become hazy.

On examination the tension was found to be + 1, and there was exophthalmia of the right eye. The cornea was hazy; the palpebral and bulbar conjunctiva were much injected; the movements of the eye outwards and inwards were insufficient. Ophthalmoscopic examination showed floating particles in the vitreous, and, as she was *myopic*, a crescent; the peripheric retinal veins were injected. The whole retina was redder than natural; near the macula were several hæmorrhagic spots. The heart, arteries, lungs, and the urine were normal. She could read No. 1 at 3 inches distance. Two leeches were ordered to the right temple; alternating instillations of atropine and eserine were ordered, but the former gave pain and was discontinued.

Ten days later, severe periorbital pain being experienced, with acute chemosis, the teeth were examined, and two carious teeth and a stump were found and promptly extracted. The results were

remarkable. In the course of three days the patient was greatly improved in health, the chemosis had disappeared, as well as the injection of the conjunctiva, and above all the exophthalmia.

In such a case as this we might attribute the relaxation of the vessels spoken of as conjunctivitis to paralysis of the vaso-motor system, and consequent passive dilatation of the conjunctival capillaries; whilst the protrusion of the globe may have been due to relaxation and loss of tone of Turner's periorbital unstriated muscle and of the several recti muscles, as well as to relaxation of the vascular and lymphatic systems behind the globe—all conditions that are explicable on an inhibitory influence being exerted by the damaged tooth.

That *strabismus* may be induced by dentition, and especially by difficult dentition, is, I think, generally admitted. Travers, as long ago as 1824, wrote: "Strabismus is also a symptom of irritation arising from difficult dentition." Many cases of strabismus come on quite suddenly, sometimes without the occurrence of any fit, but oftentimes immediately after a fit, during the first year of life, and therefore, when the muscular exertion of the eye, requisite to be made to effect accommodation, can have had nothing to do with it; for few children look intently at near objects, when alone the accommodation is brought into play, during the first few months of their existence. Yet the opinion that

dentition is a cause of strabismus seems to rest on general consensus of opinion only, rather than upon any special well-authenticated cases. And the frequency with which it is referred to in recent books is much less than was formerly customary ; in fact, in some of the more recent treatises in Germany and France it is not even mentioned. This is attributable to the important generalisation of the ætiology of strabismus made by Donders, that in by far the greater number of cases it is due to hypermetropia.

The time at my disposal will not permit me to enter into any details in regard to the mode in which hypermetropia, or long-sightedness, leads to strabismus, but it will be enough to say that the hypermetropic eye is a flattened eye, that in accommodation for near objects great convergence of the eyes is required, and that a powerful and sustained nervous impulse is required in order that a near object should be fixed by both eyes, and that, owing to defective association between the effort for accommodation and that for convergence, convergent squint is frequently induced.

Other striated muscles that have been noticed as being occasionally affected in a reflex manner by disease of the teeth have been the levator palpebræ and the orbicularis palpebrarum ; the former supplied by the third nerve, the latter by the seventh ; the paralysis or paresis of the former

leading to more or less expressed *ptosis*, the latter to *lagophthalmos*. Ely* has recorded three good cases of such affections, in one of which there was paresis of the orbicularis palpebrarum, with irregular spasm of the ciliary muscle and monocular diplopia. In another there was paresis of the rectus internus and ciliary muscles, and in a third case partial paresis of the third nerve.

An affection that is not unfrequently observed is that which is termed *blepharospasm* or incessant winking of the lids, the movement being sometimes limited to the orbicularis palpebrarum, but at others extending to other muscles, such as the zygomatici and levatores anguli oris. This affection is well known to be associated with the error of refraction known as hypermetropia, when a powerful effort of contraction of the ciliary muscle is demanded. The impulse emanating from the brain, instead of being limited to the nerve supplying the ciliary muscle, has a strong tendency to radiate through other channels, and consequently to affect other muscles; whilst in some instances the secreto-motory fibres of the fifth nerve are excited, and a copious discharge of tears results.

But that similar conditions may be established in a reflex manner by some lesion of other nerves is well shown by a case that was reported many years ago, by Von Gräfe, to the Medical Society

* "New York Med. Record," Nov. 11, 1882.

of Berlin. In this instance the blepharospasm ceased almost instantaneously when pressure was made upon a point situated below the alveolus of the third inferior molar tooth. At this point an incision was made down to the bone, but without modifying the blepharospasm in any appreciable degree. But having then established the fact that compression of the sub-orbital nerve and of the temporal branch of the malar materially diminished the spasm, section of these nerves was performed. The spasm immediately ceased, and the case was thought to be cured, but it re-appeared at the expiration of a fortnight. The section of the inferior dental nerve performed within the mouth ultimately caused the blepharospasm to cease entirely, and it had not re-appeared four weeks after. A case of convulsive tic, as he terms it, has also been recorded by Mitchell, which, supervening spontaneously, was propagated to the muscles of the neck and arms, and which entirely disappeared after the removal of several teeth.

As additional evidence of the influence of the stimulation of other and distant parts of the nervous system on the orbicularis may be mentioned the observations of Claude Bernard ; for this experimenter found that section of the sympathetic is followed by partial closure of the lids, and inversely if blepharospasm is induced in an animal by irritating the cornea with some caustic substance it may

be removed by galvanising the sympathetic in the neck, when the lids open immediately, as by magic.

From the consideration of the influence of carious and painful teeth upon the striated and unstriated muscular tissue of the eye, I pass to that which they may be supposed to exert upon the conjunctiva, cornea, and sclerotic. And I would refer, in the first instance, to the affection named *phlyctenular ophthalmia*, which is very frequently associated with carious teeth, and which I believe to be often caused by them.

Phlyctenular ophthalmia consists in the appearance of one or more small vesicles, soon bursting and forming ulcers around the margin of the cornea, or on the surface of the cornea, or of the sclerotic. Sometimes only one is formed; at others a succession appears. They sometimes produce little or no uneasiness; at others they are attended with great intolerance of light, and abundant lachrymation. The child—for the disease occurs more frequently in children—keeps in the dark during the day, and only becomes lively at night.

The pathology of this disease is tolerably well known. It is believed to result from an inflammatory process, attended with the proliferation of nuclei along the sheaths of the nerve. The nuclei gradually advance towards the surface along the conjunctival, corneal, and sclerotic branches of

the fifth nerve, and accumulating on the surface, form, with a little fluid, the contents of the vesicle, and when the vesicle bursts they gradually break down and disappear.

Now in cases of phlyctenular disease I have been accustomed to give minute directions in regard to diet, believing that this affection owed its origin to reflex irritation of the nerves of the eye, consequent upon some disturbance of the stomach and intestinal canal ; and to the mothers of the numerous little patients suffering from this affection in our ophthalmic hospitals and departments of hospitals, I have been accustomed, after ordering a brisk purge and some quinine, to say, “Attend to its diet ; no sweets, no pastry, no raw fruit. Give it bread and milk, finely cut-up meat and potatoes,” and I am perfectly satisfied with the result of that treatment ; but it has occurred to me that the view I have hitherto entertained of the ætiology of the disease may be erroneous, and that instead of the stomach, the teeth are perhaps the organs at fault. It is easy to comprehend that the mastication of raw apples, candied lemon and orange peel, jam tarts, and the like, lead to the impaction of acid and fermentable substances in the cracks and crannies of the teeth, especially if these are carious, and that remaining there for hours or days, if the due cleansing of the mouth after food is neglected, such particles may set up inflammatory troubles

which may propagate themselves along the nerve and lead to what we term reflex phlyctenular inflammation of the eye.

No doubt there are many exceptions to the rule that carious teeth and phlyctenula of the conjunctiva are associated, but I have noticed that a large proportion of the children who have phlyctenular ophthalmia have also carious teeth. Surely this is very suggestive of the ætiology of the affection.

The occurrence of inflammation of the conjunctiva in such cases as the foregoing, as Weinberg remarks,* may be explained on two theories: on the one hand, when any organ is under the influence of some stimulus, this influence may modify the nerve filaments which terminate in this organ, and thus occasion phenomena of a reflex nature, either in the eye or elsewhere.

But it may also happen that the irritative process itself, whatever that may be, may propagate itself until it reaches the filaments which excite the neighbouring organ. It is evident that this can only happen when the filaments supplying the affected organs are derived from the same nerve, or when there are anastomoses between two nerves distributed to different organs. The two kinds of propagation, he observes, are well exemplified in the case of a carious tooth. In one

* "Recueil d'Ophthalmologie," Nov., 1882.

instance there shall be well-marked conjunctivitis which resists ordinary treatment. The mouth is examined and a carious tooth is found the very existence of which is unknown or forgotten by the patient, so slight has been the inconvenience he has experienced from its presence. The tooth is extracted, and the conjunctivitis forthwith and spontaneously disappears. This is a case of purely reflex action. But other cases are met with in which odontalgia is present, and in which the redness of the conjunctiva is accompanied with the small phlyctenular ulcers to which attention has just been drawn, with chemosis, and some impairment of vision. The pathogeny of this affection is more complex: part of the symptoms are here due to reflex irritation, but part also to an extension of the dental neuritis to the ophthalmic branch.

In the course of nine months' out-patient practice, Weinberg believes he met with 188 cases of ocular disease dependent on dental lesion.

I have some reason for believing that serious lesions of the cornea may be primarily due to carious teeth, and I will venture to give you the heads of a case that I watched with much interest, but which ended disastrously so far as the eye was concerned.

J. F., a stout, ruddy Scotch girl, aged twenty-four, previously healthy and with good family history, suddenly, after exposure to cold, was

seized with a sudden sharp pain on left side of face. The vision was then good on that side, but after a few days became dim. A small circumscribed collection of pus formed exactly in the centre of the cornea, and she was then brought to me. She was treated for a few days with quinine and hydrargyrum c. creta, and with atropine drops, no improvement resulting. I performed paracentesis corneæ at the side of the cornea, which the girl bore without flinching. Slight improvement followed. Local depletion, in the form of leeches and blisters, and general tonic remedies, strychnia and iron, were prescribed; but, the case dragging on, I again determined to tap the cornea, and this time passed the needle through the little abscess. The extreme indifference she showed to the puncture attracted my attention, and I then discovered that the cornea was anæsthetic, and that the sensation of the whole region supplied by the ophthalmic branch of the fifth was greatly impaired, though not quite lost. She was a servant, and as the case was likely to prove a troublesome one, she was taken into St. Bartholomew's Hospital under my care. The abscess had now become an ulcer; the cornea was generally hazy; there was much conjunctivitis, but no chemosis. She could distinguish the points of a pair of compasses at a distance of 1·5 c.m. over right brow, but only at a distance of 4·5 c.m. over left brow. Special attention was now paid to the teeth.

She stated that she had suffered much from toothache, and several carious teeth were found in both jaws, but especially on the left side. Four molars were extracted at once. In the course of a month from this time the cornea had become clearer; some hypopyon previously present disappeared. The iris could be seen, and vision, which had been almost lost, recovered sufficiently to enable her to count figures, whilst the anæsthesia of the globe almost vanished. She left the hospital and took a cook's place, but she returned about seven months after stating that the eye had slowly deteriorated, perhaps from exposure to heat, and although there was now no loss of sensibility, the inflammation of the cornea and of the sclerotic, and the general discomfort from the condition of the globe, preventing her from doing her work, was so great that I determined to perform abscission, which was done nearly a year after the commencement of the disease, and the girl made a good recovery.

The lesion of the cornea in such a case as this may be referred to its anæsthetic condition; but the question arises, What caused the anæsthesia? and I can suggest no cause for it except that her teeth were seriously affected.

I now proceed to the consideration of the last class of cases into which I divided the ocular troubles caused by dental lesions, namely, those

in which the reflex action is exerted upon the optic nerve and retina and intra-ocular structures.

And first in regard to the occurrence of *amaurosis*; the most brilliant case on record is one that is now of somewhat ancient date, having been given by Sir William Lawrence, but which is so convincing that I venture to reproduce it here.

“CASE 7. *Amaurosis caused by a carious tooth.*—F. P., thirty years of age, possessing a good constitution, and enjoying good health, with the exception of pains in the head and limbs, which never lasted long, suddenly experienced, in the autumn of 1825, a violent pain, shooting from the left temple to the eye and the side of the face: he ascribed it to cold. This pain lasted several days, then lessened, and reappeared from time to time without being sufficiently severe to induce the patient to seek medical aid. In about two months it suddenly increased in intensity, occupying the eye particularly, with a feeling as if it would pass out of the orbit. F. P. now discovered that he was blind with that eye, and applied to a neighbouring physician, whose treatment, continued for two months, did no good. The pain, however, was no longer continual: it assumed a somewhat periodical character, leaving the patient easy for some hours of the day. At the end of the following six months the pain increased, the cheek swelled, some spoonfuls of bloody matter were discharged by

a spontaneous opening in the lower eyelid, after which the swelling subsided, and the pains nearly disappeared, although the blindness remained complete. The discharge was renewed from time to time during the following six months, and there was no great suffering. But in the autumn and winter (1826) the pain, particularly in the eye, became so violent that F. P. came to Wilna in the beginning of 1827, determined to have the organ extirpated, if no other remedy could be found. Professor Galezowski found the left eye totally insensible to light, with the pupil dilated, and no other visible alteration. The pain, not then so severe, consisted in violent occasional pricking or darting sensations in the left temple and parts round the eye. There was discharge from the lower eyelid. The first molar tooth of the left side was carious; it had not caused much uneasiness; and the toothache, when it existed, had not coincided with the pains in the temple and eye. The Professor determined on removing this tooth, and having done so, was surprised to see a small foreign body at the extremity of the fang. When drawn out, it proved to be a small splinter of wood, about three lines in length, which had traversed the centre of the tooth, and had probably been introduced in picking the teeth. A probe was passed from the socket into the antrum, from which a few drops of thin purulent fluid escaped. The pain ceased almost entirely, and on

the same evening the eye began to be sensible to light. Vision gradually improved, so that, on the ninth day, the patient could see as well with the left eye as with the right, after a blindness of thirteen months; on the eleventh day he left Wilna to return to his family."

"I had," says Sir William, "the pleasure of becoming acquainted with Professor Galezowski when he visited England subsequent to this occurrence. He showed me the tooth and the splinter of wood, and he pointed out two circumstances in the case as particularly worthy of notice: first, that the entrance of the foreign body into the tooth had not been noticed at the time; and secondly, that a local irritation, hardly perceived at the seat of injury, should have affected the ramifications of the nervus trigeminus so violently as to produce amaurosis."

I have met with no other case that is so complete as this; but Caffé* refers to a case in which blindness proceeded from a carious tooth of the upper jaw, and occurred whenever food collected in the cavity; and I have myself recently met with a case in which loss of vision occurred for a few minutes each time that, in clearing the cavity of a carious molar for plugging, the instrument caused pain.

Sir Thomas Watson† refers to the repeated occur-

* "Lancette Française," Aug. 22, 1839.

† "London Med. Gazette," fig. 5, 1841.

rence of blindness cured by the extraction of irregularly arranged teeth. Sudden blindness occurred in a boy eleven years of age. This was immediately cured on the removal of two permanent and four milk molars from a very closely compressed set of teeth; and Garretson* reports a case given by Salter. A woman, twenty-four years of age, suffered from violent pain in the right upper first molar, which was accompanied with great swelling of the face; the globe was protruded, and vision was lost. A fistulous opening, from which pus flowed abundantly, existed at the outer as well as at the inner angle of the antrum. The cause of the supuration in the antrum was the remains of the first upper molar; when this was removed a sound was passed into the antrum and a sequestrum was brought away. This proved to be the antral part of the floor of the orbit, the upper part of the malar bone, with the foramen infra-orbitale, and a broad, bony plate of the nasal wall of the antrum. The inflammatory symptoms immediately subsided, but there was no perception of light, and the pupil remained immovable. Five weeks subsequently the pupil began to respond to light, but there was no return of vision. Ophthalmoscopic examination of the eyes showed white atrophy of the optic disks. Gill concludes his essay with the statement that the phenomena which depend upon the

* Virchow Hirsch, *loc. cit.*

optic nerve are attributable to a plastic inflammation, which affects the extra-cranial portion of the nerve. If the optic nerve is destroyed by this means, the blindness is persistent. The oculomotor nerve suffers temporarily only; therefore also there is only temporary rigidity of the pupil. The protrusion of the bulb indicates that the sixth nerve is little or not at all affected. Mr. Gill is doubtful whether to regard the anæmia of the optic nerve as a cause or a consequence of the abolished function.

A case of sympathetic disease of the eyes in consequence of irritation of the dental nerves is given in the "*Revue de Thérap. Med.-Chir.*," Aug., 1871. The ocular and palpebral conjunctivæ of the eyes and eyelids were much congested; the vessels filled to the corneal border. Severe pain was experienced at night; there was considerable photophobia; the head was heavy and painful, tongue coated, appetite bad, pulse small and frequent. The affection lasted five months. Ten leeches were applied to the angle of the jaw, a collyrium of sulphate of zinc and a purgative prescribed, which led to some improvement. After the application of a blister to the back of the neck the pain recommenced. As the left molar was very carious it was removed, with the effect of immediately removing the symptoms, and in the course of a week the patient could use the eye again.

Gill, about the year 1873, read a paper before the Missouri State Medical Association, on "Disturbances of vision resulting from neuralgia of the fifth pair of nerves consequent on dental affections," which I have not been able to procure, but which is translated in the "*Deutsches Vierteljahrschrift für Zahnheilkunde*," B. IV, p. 11, and is fully abstracted in the section on "*Mund und Zahnkrankheiten*" by Dr. Albrecht, in the "*Jahresbericht für Gesammten Medicin*" (V. Virchow, V. Hirsch) for 1873, B. II, p. 537. The following case is given in this paper. The patient was thirty-three years of age, and in the early part of the winter of 1870-71 began to experience neuralgic pains in the head and face, which lasted to the middle of the summer. The neuralgia extended over both sides of the head, and so far affected the visual power that the patient was no longer capable of reading. In the middle of the summer the neuralgia disappeared, and the vision became normal. In July, 1871, the neuralgia recurred, and coincidently there was diminution of visual power: the patient could only read Jäger No. 16. The pain experienced was especially severe at night. Examination with the ophthalmoscope showed that there was sub-retinal effusion, and that the retinal arteries were ill-defined. There was a well-marked painful spot.

Examination of the apparently sound teeth

showed that there was necrosis of the exposed left superior maxilla, but more careful examination demonstrated that the supposed necrosis was only a collection of tartar, which had surrounded the roots of the first and second molars. These two teeth were extracted, and a wide zone of ulceration was found around their roots, and to a smaller extent about the root of the second bicuspid, which after the lapse of a few days was also removed. The neuralgic symptoms immediately abated; the amblyopia, or dimness of vision, was reduced, and in the course of a week the patient could read again No. 6.

Mr. Hutchinson, in one of the early volumes of the Ophthalmic Hospital Reports,* has pointed out that certain cases of amaurosis bear a very close resemblance to infantile paralysis. "Without any warning whatever, without any cerebral symptoms, a patient loses the sight of one eye, and now and then, but very rarely, of both eyes." In some cases, he goes on to remark, there is a certain amount of improvement afterwards, but often the amaurosis becomes total and permanent. In some instances the optic disk becomes white and atrophic, but in others it retains an almost normal vascular supply. Most of the cases which had come under his notice were women. In some, evidence of cardiac disease existed; in others there was none; and in most he

* Vol. IV, p. 382.

found the *arteria centralis* of good size, so that the hypothesis of embolism seemed to him to have but little support. In several of the best marked cases that he had seen there was a history of neuralgia in the face for a long time before the occurrence of the amaurosis, the neuralgia being usually connected with toothache.

Alexander of Aachen has reported* the following case of amaurosis resulting from dental disease.

A patient, æt. twenty-six, had slight myopic astigmatism, which was, however, insufficient in amount to explain the greatly lowered visual power of the right eye. The right optic disk was somewhat hyperæmic. Abstraction of blood was ineffective, and in a subsequent examination the failure of vision was so great that the patient could only read Jäger No. 15. The patient then complained of severe pain in the upper right anterior molar tooth, and observed that it had been for some time periodically affected. The tooth was extracted, and vision almost immediately rose to two-thirds of its normal amount in the right eye, and became quite normal in the left eye.

In this, as well as in other reported cases, the eyes have often been slightly defective originally, and it stands to reason that any sympathetic influence is more likely to be felt by those in whom the functions of the eye are from any other cause

* "Monatsblätter f. Augenheilk," B. VI, p. 42, 1868.

impaired; or perhaps it might be said that sympathetic affections are more likely to be super-imposed upon defective than upon sound eyes. Thus a patient who has perfectly healthy eyes may long resist the depressing influence of toothache, but if his eyes are already congested or exhausted from uncorrected hypermetropia, it is easily intelligible that pain, by depressing the nervous energies, will cause the weakness of the ciliary muscle to be felt at an earlier period.

A similar case, in which an amaurotic condition of the eyes was improved by the removal of the stopping from a carious tooth, and was subsequently entirely cured by the removal of the tooth, has been reported by Dr. M. F. de Witt.* A strong and healthy man, æt. thirty-one, discovered that his right eye was blind. No pain, no photopsiæ had been experienced. He could distinguish light from darkness with the affected eye, but that was all. He was unable to give any account of the cause of the attack, but after a while he remembered that two months before losing his vision several teeth had been stopped. He had often felt pain near the first molar tooth of the right side, and he had often also experienced pain and tenderness of the gums, and abscesses had formed which he had himself opened with a penknife. On examination the tooth was found to be reduced to a shell, with

* "Amer. Journ. Med. Sci., N. S.," CX, p. 382, April, 1868.

a fistulous opening leading to the alveolus. Dr. de Witt, suspecting irritation of the fifth nerve proceeding from the teeth, removed the stopping in order to obtain a counter-opening, and to permit the fistulous orifice to close and to arrest the irritation. The immediate effect was that the gum ceased to be sore, and the visual power began to improve. After three weeks, when the sharpness of vision had greatly improved, the gums again began to be sore, and coincidentally the acuteness of vision diminished. The affected tooth was extracted, and improvement then again took place, and vision became restored almost to its normal amount, though still not equal to that of the other. The fang of the tooth was filled with pus.

M. Nicaise* remarks that he knew that in certain cases the irritation of a dental nerve may induce troubles, which indeed are often only transitory, of vision. These disturbances are explicable on the ground of the intimate relations which exist between the different branches of the fifth pair of nerves, the function of which is sensory, and which govern also the nutrition of the regions to which they are distributed. If the irritation of the fifth nerve is persistent, and if it ends by effecting some alteration in the nerves, it is possible that the disturbances of vision may become more serious and even permanent. Glaucoma, which is especially due

* "Gaz. Méd. de Paris," 1871, p. 150.

to troubles of nutrition, may possibly have its point of departure in a lesion affecting the superior or inferior dental nerves.

The relations of the teeth to glaucoma have been considered by several writers, but especially by Hermann Schmidt* and by Priestley Smith, whose remarks upon the subject are very sensible.†

Glaucoma is a condition of the eye in which the humours of the eye are secreted in larger quantity than they can be taken up by the absorbents; the tension of the eye is therefore increased, it becomes hard and exquisitely tender, then extremely painful; the vessels of the retina are often seen to pulsate, and finally, after a period of suffering of variable duration, it quiets down, but the disk remains cupped, and vision is either altogether lost, or permanently and seriously impaired. I may say, in passing, that the cases of blindness which come before the ophthalmic surgeon from this cause are amongst the most melancholy that he sees—melancholy because he feels that in the majority of cases, if the surgeon in attendance, instead of being misled by the specious term “neuralgia,” had recognised the disease and insisted on the performance of iridectomy during the first two or three days of pain, sight would have been perfectly preserved.

In regard to the pathology of this disease it is

* *Archiv. f. Ophthal.*,” XIV, i, 107

† “*Glaucoma : its Causes, &c.*,” 1879, p. 10, *et seq.*

enough to state here that the increased hardness or tension of the eye is due in part to hyper-secretion, and in part to imperfect drainage of the aqueous fluid. How are these conditions produced? The imperfect drainage we know is produced by a narrowing of the depth of the anterior chamber, which interferes with the entrance of the aqueous humour into the canal of Schlemm and its passage outwards, and this is the result of the approximation of the iris to the cornea, either by enlargement of the lens, as Priestley Smith thinks, or by the formation of adhesions between the iris and cornea, as others believe.

But is there any evidence of hyper-secretion, and if there be, is the fifth nerve the exciting or even a predisposing cause?

It is certain that pain in the region of one or other of the branches of the fifth is a precursor of glaucoma in a large number of cases; and the presence or absence of ciliary neuralgia is mentioned in the report of almost every glaucomatous case.

But the most convincing evidence of the point in question is that which is derived from the experiments of Von Hippel and Grünhagen.* These observers found that whilst the normal tension of the contents of the eyeball is about 1 inch of mercury, if the aorta were compressed the tension

* "Archiv. f. Ophthal.," XIV, iii, pp. 219-258.

rose to about 3 inches of mercury, and if now the fifth nerve was stimulated the pressure rose to as much as 8 inches of mercury, and at the same time well-marked pulsations were observed. Even when the stimulation of the fifth was discontinued the tension was permanently increased, and the augmentation was perceptible even after death. It is not clear whether the trigeminus here acts as a true secreto-motory nerve in the same sense that stimulation of the chorda tympani causes increased activity of the salivary secretion, or whether it acts simply by causing dilatation of the bloodvessels, and thus leading to an increased supply of blood to the organ.

The determination of this point, however, matters little from our present point of view. It is sufficient that irritation of the fifth causes marked increase in the tension of the eye, and it is easy to understand that in all cases where from physical changes consequent on gouty or rheumatic inflammation of the iris, the eye is ripe for an outburst of glaucoma, the spark may be supplied by the irritation of a carious tooth.

It is but right to add, however, that Priestley Smith has made a series of tonometrical experiments at the Dental Hospital in a series of cases of toothache. The results he obtained were not very decisive, though he arrived at the conclusion that in young persons toothache rarely, if ever, causes a

decided rise of tension. He estimated the tension in sixteen persons suffering at the moment or recently from severe pains in the teeth, and found on the whole little or no appreciable difference.

The writing of this paper has recalled to my memory various cases which were in the highest degree suggestive of the teeth being the starting-point of the trouble, and to which I regret extremely I did not direct a larger amount of care and attention at a period when it might have proved of service. To give one only :—

Mrs. S., æt. thirty-two, a stout, ruddy-complexioned woman, suffered in 1878 and 1879 from coloured haloes round lights, and the general symptoms of threatening glaucoma. For these there was no apparent cause. She was healthy, in easy circumstances, and her habit of body and general manner of life were thoroughly normal and good. She, however, suffered severely from toothache. A particular tooth would begin to ache, without apparent decay of the crown. After enduring the pain for some time she would have the tooth extracted, and an abscess was always found to exist at the root. In March, 1880, after a fall which intensified all the symptoms, an iridectomy was performed on the left eye. The wound did not heal kindly, and a cystoid cicatrix was the result. The vision gradually deteriorated, and ultimately was entirely lost.

She now had two miscarriages, and some circumstances occurred in the family causing her much mental distress and depression of spirits, with frequent shedding of tears. I saw her first about eighteen months after the operation had been done.

The right eye was now the seat of trouble, but the vision was still very good, and with appropriate glasses (+ 1 D) could be rendered perfect. Three weeks previously she had awaked with violent pain, which lasted for three days; she saw bright lights, and the eye was hard, and the optic disk was white and cupped. She was told she had glaucoma, and that if the vision deteriorated she must submit to an operation. It did deteriorate rapidly, and I performed an iridectomy in the hope of saving vision, but the wound passed through the same stages as with the previous operation, and a cystoid cicatrix was formed with persistent high tension of the globe of the eye. I saw her only a few days ago with complete blindness of the left eye, and only perception of very bright light in the right eye. She again repeated to me the story of the teeth, and I could not but think that if a similar case appeared before me now, instead of trying iridectomy—which was here a signal failure, even when performed by two different operators, and which resisted eserine, and all the usual methods of reducing tension—I should at once have every tooth carefully and thoroughly

inspected by an experienced dental surgeon. And I would ask whether such a case is not adapted for the removal and replantation of teeth, if these, after extraction, were found to be sound.

I fear, Mr. President and Gentlemen, that I have wearied you with cases, but I trust I may stand excused when I say that most of these cases are germane to the matter, and that my object has been in part to draw the attention of some amongst you who may not have given it a thought, to the close relationship which exists between the teeth and the eye, different as these organs are in their mode of development, their histological characters, and physiological uses, and in part to elicit from you some information that may prove of service to the ophthalmic surgeon, and may afford him some hints of the kinds of disease of the teeth which he is likely to overlook, and which it is important that he should recognise.

In conclusion, then, I think it may be laid down as a maxim to be generally observed that in all cases of threatening glaucoma, especially when this is associated with ciliary neurosis and obscure pains in the temples and maxillary orbital regions—in all cases of mydriasis, and probably of myosis, originating without apparent causes—in all cases of sudden paralysis of either of the orbital muscles, or of loss of sensation in the absence of cerebral symptoms—in all cases of phlyctenular

disease of the conjunctiva—in all cases of ulcers of the cornea resisting ordinary treatment—in all cases of sudden failure of accommodation, especially in young children—and finally, in cases of exophthalmia, the condition of the teeth should at least be examined, and if faulty conditions present themselves these should be at once rectified, and then one at least of the possible causes of each of these diseases will be removed.

SCHMIDT: "Accommodations beschränkungen bei Zahnleiden; Gräfes Archiv," XIV, i, p. 107.

ZETUNDER: "Klin. Monatsblätter," 1866, p. 269; 1868, p. 42.

GALEZOWSKI: "Journal d'Ophthalmologie," I, p. 606.

KEYSER: "Dental Times," 1870.

"St. Louis Med. and Surg. Journ.," 1872, p. 302.

BLANC: "Journal des Connaiss. Med.-Chir.," 1871, No. 27.

TAVIGNOT: *ibidem*, Ap. I.

"Gaz. Med.," 1871, No. 34, p. 369.

CHEVALIER: *id.*, 1871; p. 461.

SCHMIDT'S "Jahrbücher," B. 129, p. 219; B. 131, p. 178; B. 133, p. 114; B. 138, p. 354.

"Hirsch Jahresbericht," 1873; B. II, p. 537.

HUTCHINSON: "Ophthal. Hos. Rep.," IV, p. 381.

WECKER: "Ann. d'Oc.," T. LV, p. 130.

"Recueil d'Ophthalmologie," 1882, p. 441.

AUGE: "De l'influence de la première dentition sur le développement de la Blepharo-conjonctivite; These," 1881. E. Baillière.

PRIESTLEY SMITH: "Glaucoma: its Causes, &c.," 1879, p. 10, *et seq.*

RITOURET: "Annal. d'Ocul.," LI, p. 226.

CAFFE: "Lancette Française," 1839; Aug. 22.

WATSON: "Lond. Med. Gaz.," 1841; fig. 5.

"Revue de Thérapeut. Med.-Chir.," Aug., 1871.

DECASSIN: "Bull. Acad. Med. Belg.," T. XIII, 1853.

"Gaz. Méd. de Paris," T. XXVI, Ser. 3, 1871.

"Gaz. Méd. de Paris," 1871, p. 150; and Mem. presented to the Acad. de Médecine, 1869.

DEMORRES: "Traité," T. I, p. 376.

DISCUSSION.

The PRESIDENT said he felt they were deeply indebted to Mr. Power for the evident pains he had taken in the preparation of the very valuable and interesting paper they had just been listening to. It was, indeed, a most important addition to the literature of the subject treated of, which did not appear to have hitherto received from surgeons as much attention as it deserved. He regretted exceedingly, therefore, that they had not longer time available for its discussion. (Cries of "Adjourn the discussion.")

If the majority of the members wished that the discussion should be adjourned, he should be very pleased to adopt that course, though he feared it would be attended with some inconvenience.

On the question being put to the meeting, the numbers voting for and against appeared to be equal, and

The PRESIDENT said that under these circumstances it devolved upon him to give the casting vote, and he felt obliged to decide, most reluctantly, against the adjournment, but only for the reason that he was informed by the Secretaries that engagements had already been entered into which would fully occupy the whole available time of the next two meetings. He would, therefore, beg members to condense their remarks as much as possible, so as to make the most of the time at their disposal.

He had himself met with one case which appeared to be very much in harmony with some of those related by Mr. Power. He had brought it under the notice of the Society about three years ago,* and would only now state the principal facts. A gentleman, who had been compelled to retire from business owing to complete loss of sight in the left eye and commencing failure in the right, came to consult

* See "Transactions," Vol. XII, *New Series*, p. 140; March, 1880.

him at the request of his medical attendant. On careful examination, the second left upper molar was found to be diseased; it was extracted, and the discharge of nearly an ounce of pus from the antrum followed, though there had been no bulging of the cheek or other sign of abscess in this situation. Within three months the sight of the left eye had become perfectly restored, that of the other having recovered itself within a still shorter period.

MR. CHARTERS WHITE said he could not help remarking, while the paper was being read, the evident interest with which it was followed by the audience. It was certainly a subject of great interest to dental practitioners, since it was one on which there was very little information readily available, though all were occasionally liable to meet with cases similar to those quoted by Mr. Power. He had himself met with a case of the kind about four years ago. A young lady, of scrofulous diathesis, came to him with the pulp of the second left upper bicuspid much inflamed. He advised extraction, but the patient would not submit, so he dressed the tooth and told her to come again. He noticed at the same time that the cornea of the left eye was nebulous. When she returned there was acute inflammation of this eye, and the state of the tooth being still unsatisfactory, he again urged extraction, but without effect. The opacity of the left cornea increased, and after a time the right also became hazy. Then at last the patient consented to have the tooth removed. Marked improvement in the state of the eyes at once took place. The patient went to Eastbourne, where the keratitis gradually subsided, and she made a better recovery than might have been expected; the sight of the left eye being, however, somewhat impaired.

MR. W. A. HUNT said he rose to express the great regret and disappointment he felt that more time should not have been allowed for the reading and discussion of such a valuable paper. He saw before him a diagram to which Mr. Power had no doubt intended to refer, had he not been obliged, unfortunately, to shorten his paper. He saw there the

various ganglia which connected motor and sympathetic branches with the sensory fifth,—the ophthalmic, Meckel's, the otic, and the submaxillary. He should have liked to hear the relations of these remarkable bodies explained by so good a physiologist as Mr. Power. With regard to the discussion also, he felt that it was quite impossible to do justice to such a paper in the very short time which was available for the purpose that evening.

MR. COLEMAN said he quite agreed with what had been said as to the value of the paper, and should have been very glad if arrangements could have been made for prolonging the discussion. As the time was short, he would only state that, in his experience, conjunctivitis was the most common ophthalmic affection arising as the result of dental irritation. He remembered, however, a case of amaurosis due to this cause, which had occurred in the practice of the Dental Hospital, and which was recorded in the Transactions of the Society about seven years ago. A woman applied who had broken off her left upper central, and one of the students kindly undertook to pivot it for her. He did so, and the patient at once lost the sight of the left eye. The tooth was removed, and within three days her sight was as good as ever.

MR. T. W. NUNN, on being referred to by the President, said he had long been convinced that affections of distant parts were not unfrequently produced as the result of dental irritation, though the cause was in most cases quite overlooked. He had brought this subject before an allied society in a paper read six or seven years ago. He would only mention one instance, that of a gentleman who for a long time suffered from occasional intense pain in one knee. He obtained the best advice, but no disease could be detected in the joint, and no treatment seemed to have any effect upon the pain. One day, when a dentist was examining his teeth, he touched one and the patient immediately felt the pain in his knee. The tooth was extracted, and the gentleman was thenceforth relieved of his pain.

The PRESIDENT said that, as the usual time for closing the

meeting was already past, he felt obliged, most unwillingly, to stop the discussion. He would ask the members present to give a vote of thanks to Messrs. Storer Bennett, Hunt, Macleod, Sewill, and the other contributors of Casual Communications and specimens, and especially to Mr. Power for his exceptionally interesting paper, which had evidently been appreciated as it deserved.

The vote having been carried with much applause, the President adjourned the meeting.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

December 3rd, 1883.

DR. JOSEPH WALKER, PRESIDENT, IN THE CHAIR.

The Minutes of the previous meeting having been read and confirmed,

The PRESIDENT announced that MR. JOHH MCKNO ACKLAND, L.D.S.Eng., of 24, Southernhay, Exeter, had been duly nominated for election, and would be balloted for at a subsequent meeting.

MR. REES PRICE signed the Obligation Book, and was formally admitted to Membership by the President.

MR. HUGH PATERSON, of Sydney, New South Wales, was balloted for, and elected a Member of the Society.

MR. WILSON, of Edinburgh, showed a geminated bat's tooth. He believed gemination to be rare in the pterodactyli; he had never heard of the existence of a specimen like that now exhibited.

MR. WHITE, of Norwich, showed models of the mouth of a young lady, aged eighteen, one of a large family, all the rest of whom had, he believed, the usual dentition. He had examined five of them, and ascertained this to be the case. This young lady had five molars in the lower jaw, together with the roots of a sixth, and the wisdom teeth were just in process of eruption; she had, however, only two lower bicuspid. The teeth in the upper jaw were normal.

He showed also a specimen of remarkably perfect union of a lower right central and lateral; it appeared like one large

tooth, and as if it had been developed from one germ. The patient from whom it was taken was a gentleman, aged fifty, who had been under his care at intervals for twenty years past. Latterly he had suffered much from chronic gout, and this tooth having become very loose, it had been removed. Such union was not very uncommon in the temporary set, but was decidedly rare in the permanent.

MR. HENRI WEISS related the following misadventure with the rubber dam.

A young lady came to him requiring a cavity on the distal aspect of the first right upper bicuspid to be filled with gold. After the usual preparation the upper dam was adjusted, and a cohesive gold plug was built up; but, owing to the time allowed for the operation being exhausted, the polishing was left for a future visit. In removing the rubber it became torn, a circumstance not to be wondered at considering that the gold projected beyond the cavity at every part, and had only been roughly burnished at the edges. An appointment was made for that day week, when the plug was polished by means of the corundum disc, &c.; the patient then complained of slight tenderness of the gum in the neighbourhood of the plug, which might with reason be put down to its unfinished state.

After this the tenderness increased, and general periosteal inflammation was set up. At the end of three weeks the patient returned, and, in the absence of Mr. Henri Weiss from home, was seen by Mr. Willoughby Weiss, who found on examination that the tooth next to the one which held the gold plug, viz., the second bicuspid, was loose and tender. Strongly suspecting the cause to be a silk ligature, which might have been left on, he urged the advisability of thoroughly exploring the part, but without avail, for the patient had made up her mind to lose the tooth. It was accordingly extracted, and it was then found that a ring of rubber had become detached from the main sheet and had worked its way up the roots, just as an elastic band would, denuding the root of its periosteum as it went.

The case presented two problems for solution ; first, what led to the formation of the complete ring of indiarubber ? and secondly, why were the symptoms not more pronounced upon the second visit ?

Mr. Weiss had, on this occasion, punched the hole with a wheel-shaped burhead, which not only made the hole, but made also a series of small cuts round the circumference, and he felt satisfied that this was the cause of the ring, the misfortune of its being left on the tooth being due to the unfinished state of the filling. As to the delay in the appearance of the symptoms, the following appeared to be the probable explanation. The rubber was torn by being caught by the gold whilst burnishing. The cut being started by removing the rubber, the little incisions made by the instrument used in punching the hole communicated, and a ring was formed. But it was not until the plug was finally polished that the ring was released and became capable of producing the effects he had just described.

He believed the case to be unique, and, as it was an accident which might seriously damage the reputation of the dental practitioner who might be unfortunate enough to meet with it, he trusted it would remain so.

Mr. Weiss then handed round the tooth, and also a piece of rubber sheeting punched and stretched to show the manner in which the ring had been formed.

Mr. J. B. SUTTON, Senior Demonstrator of Anatomy at the Middlesex Hospital Medical School, then read the following description of a remarkable case of absorption of the hard palate, the result of pressure :—

In the Treatise on Inflammation, &c.,* John Hunter says concerning absorption :—

“Parts are capable of being absorbed from five causes ; First, from being pressed ; secondly, from being irritated by irritating substances ; thirdly, from parts being weakened ; fourthly, from parts being rendered useless ; fifthly, from

* “ The Works of John Hunter, with Notes by Palmer,” Vol. III, p. 465.

parts becoming dead. The two first, for instance, parts being pressed and parts being irritated, appear to me to produce the same irritation; the third, or weakness, an irritation of its own kind; and the fourth, or parts being rendered useless, and the fifth, of parts becoming dead, may be somewhat similar.” (*Of the remote Cause of the Absorption of the Animal itself.*)

He then goes on to say:—

“The dispositions of the two parts of the living body, which absorb and are absorbed, must be of two kinds respecting the parts, one passive and the other active. The first of these is an irritated state of the part to be absorbed, which renders it unfit to remain under such circumstances, the action excited by this irritation being incompatible with the natural actions and the existence of the parts, whatever these are, which therefore become ready for removal, or yield to it with ease. The second is the absorbents being stimulated to action by such a state of the parts, so that both conspire to the same end.” (*Of the Disposition of Living Parts to Absorb and to be Absorbed.*)

Hunter then relates observations in support of his doctrine, “that pressure from *within* produces absorption and thinning, whereas pressure from *without* causes hypertrophy.” The general truth of these opposite effects of pressure, this truly eminent observer objectively demonstrated by several instructive specimens in the museum of the Royal College of Surgeons. Since Hunter’s days, however, these views have undergone slight modification; amended, the rule stands thus:—

Pressure from *within* produces *absorption*, for it is *constant*.

Pressure from *without* leads to *hypertrophy*, because, *usually*, it is *intermittent*.

If pressure from *without* be *constant*, it will cause *atrophy* by absorption.

The case now to be related is an admirable example of this last statement. Pressure from without giving rise to atrophy by absorption.

The specimen consists of the base of a skull taken from an old man, aged sixty years, who died from bronchitis. Some years before his death—I know not how many—he was un-

fortunate enough to contract syphilis, the scar of the primary lesion being still plainly visible. In addition to other later manifestations of the disease, perforation of the hard palate occurred. Experiencing considerable inconvenience on account of this hole allowing food and liquids to pass into the nasal chamber, he made for himself an obturator of rags. The pressure of so rude an instrument caused the opening to enlarge; in order to keep the plug of rags in position, it was necessary to augment its size by sundry other pieces of cloth or chips of wood; so filthy were the old man's habits, that these foul rags would be kept in the gap in the palate for a considerable time. So things went on for some years. At last he died.*

I found the nasal fossæ crammed full of foul and filthy rags, with here and there chips of wood; one chip of considerable size projected half an inch into the sphenoidal sinus. The anterior three-fourths of the hard palate, the whole of the alveolar arches of the superior maxillæ, with their teeth, have entirely disappeared, not a vestige remaining.

The antra, nasal fossæ, and mouth form a common vaulted chamber; the sides are formed by the thin outer shell of the superior maxillary bone, the roof by the orbital plates of the maxillæ, the superior and middle turbinate bone and the cribriform plate. The vomer has gone, the remnant of the septum being of falciform shape, and composed in part of the triangular cartilage and perpendicular portion of the ethmoid. The inferior turbinate bone is represented only by a ridge in the thin mucous membrane.

The body of the sphenoid had commenced to suffer, and atrophy had started in the inner wall of the left orbit, for the left lachrymal bone has been absorbed. The pterygoid processes are quite transparent; that part of the hard palate constituted by the palate bone is intact, and covered with very thick mucous membrane. There is not the slightest indication of ulceration anywhere in the fossæ. In addition

* For these facts I am indebted to Mr. J. R. Lunn, Medical Superintendent, St. Marylebone Infirmary.

to the condition of the palate, the base of the skull is the seat of well-marked craniotabes, affecting the cerebellar fossæ, squamous portion of the temporal bone, and the roofs of the orbits, which are so thinned that they creak under the finger like cartridge paper. The specimen is in the museum of the Middlesex Hospital Medical College.

My object in bringing this specimen here to-night is this:— It illustrates admirably what I believe Mr. Hunter had in view when he wrote the following sentence:—

“When the immediate causes arise in consequence of pressure, it would appear that absorption takes place more readily under certain circumstances than others, although the remote causes of them appear to be the same, and therefore there is something more than simple pressure.”

I must now endeavour to point out the factors in this case which put it out of the category of “simple pressure” and place it with those cases in which there is “something more” which causes “absorption to take place more readily” in this region, although at first blush it seems to be one of simple pressure.

The antral cavities, unlike certain other cranial fossæ, continued to increase in size at the expense of their boundary walls throughout the whole of life; consequently in advanced life the walls of these spaces are undergoing atrophy as a natural process. Add to this the irritation of a rude, rough, and badly fitting obturator such as this man had, then we get the normal process of absorption stimulated by irritation from the presence of so uncouth a foreign body. It is a familiar fact to every surgeon and dentist that a badly fitting obturator causes an increase in the size of the hole it was designed to close, thus illustrating the proneness of the thin osseous tissue of the palate to undergo absorption, due no doubt in part to its extreme vascularity. A specimen in the museum of St. Bartholomew's Hospital nearly approaches my case in extent of surface absorbed. It is that of a woman with deficiency of the hard palate, from what cause originally arising does not appear. To remedy the inconvenience she made an obturator of cork and plugged the opening. When

the instrument in course of time became loose from absorption of the tissues, she wound tape around it, until at last the loss of parts arrived at a condition of things almost as bad as in the specimen before the Society this evening.

There is yet a third source of irritation to be considered, *the syphilitic poison*.

That this is capable of causing atrophy of bone there can be no shadow of doubt; the most sceptical needs only to look at the tabetic patches in the base of this same skull to be assured of this truth; the roofs of the orbits are so thinned and transparent that a newspaper of ordinary type placed in the orbit may be read in the anterior fossa of the skull. All this atrophy of compact bone has taken place without the intervention of any abnormal pressure, but as a result of syphilis, which is now recognised as the cause of this peculiar thinning.

Therefore I think it must be admitted that *pressure* was not the only cause of this extreme atrophy, but that it stimulated the process of absorption, normal in this region; also that it was aided and abetted by the presence of the venereal poison, thus constituting an example of what John Hunter had in his mind when he wrote concerning the "*something more than simple pressure* promoting absorption." To be assured of this, refer to the last paragraph of the chapter, *Of the Progressive Absorption* (Vol III, p. 471, Works). It runs thus:—

"I believe that this absorption seldom if ever affects the constitution, although in some cases it takes its rise from affections of the constitution, as in the case of the absorption of callus."

From what we know concerning syphilis at the present day, no member of this Society will condemn me for adding this disease to the list of constitutional affections which give rise to or promote absorption, in the sense indicated by Hunter.

DR. ST. GEORGE ELLIOTT showed a Schmidt's press for swaging plates, with which all his gold plate work had been done for some weeks past. Its peculiarity consisted in the

use of a Spence metal die and counter-die, between which the gold plate was pressed by a screw; the advantages derived from its use being great saving of time as compared with the use of zinc and lead dies, and more accurate work.

The metal could be cast directly into the Stent impression, although Schmidt uses a plaster model, making the counter-die by pouring Spence metal upon this, and then making the die from the counter.

The PRESIDENT said a case had lately occurred in his own practice which was interesting in connection with those brought forward by Mr. Hunt at the last meeting, and by Mr. Chas. Tomes on a previous occasion. At the end of October he had to extract three teeth for a lady, one of them being a right lower wisdom tooth of very irregular shape. The operation was followed by complete loss of sensation in the lower lip on that side, which had persisted up to the present time. The patient, in a letter he had lately received from her, said she could prick the chin and lip on that side, without feeling any pain, and that the teeth and gums on that side were also without feeling; she could, however, move both lips and jaw perfectly. He had received a communication from her that day in which she stated that there was not yet, though it was six weeks since the operation, any sign of sensation returning.

ADJOURNED DISCUSSION.

The PRESIDENT then invited the members and visitors present to resume the discussion on Mr. Power's paper on "The Relation between Dental Lesions and Diseases of the Eye."

Mr. MACNAMARA said he had come to the meeting that evening to learn rather than to speak, still he was glad of the opportunity of expressing his obligation to Mr. Power for the exceedingly interesting and instructive paper which he had lately had the pleasure of reading. He believed it to be the most complete collection of facts bearing upon this important subject which had yet appeared in the English language. So far as he himself was concerned, the subject was almost a new one, yet he could clearly see that there was a great deal in it. It had, of course, long been known in a general way among surgeons that irritation of the fifth nerve might produce orbital lesions, as, for instance, that wounds of the supra-orbital nerve might cause blindness; but the evidence bearing upon the extent and variety of the changes which might thus be induced had never before, so far as he knew, been so clearly set forth. The influence of irritation of the fifth nerve upon the eye was well seen in the cases of severe hemicrania which were so frequently met with in India. The attacks would recur in some cases every two or three days; as the pain became severe there was greatly increased vascularity of the sclerotic and conjunctiva, and on examining the deeper structures of the eye the retina would be seen to be distinctly hyperæmic, the optic disc being scarlet, with, in some cases, evidence of retinal effusion. He had never known blindness to occur, but there was often considerable impairment of vision during the continuance of the attack; he was very sorry it had never occurred to him to test the power of accommodation.

Seeing, then, that the evidence of reflex action on the eye of other branches of the fifth nerve was so clear, it was not surprising that the irritation of so considerable a branch as the dental should cause first hyperæmia, then effusion, and at last atrophy of the optic disc. But for all this he felt obliged to confess that he had not thought of this before; and it appeared to him a very great advantage of such societies as that which he was addressing, that by its instrumentality the attention of dental and general surgeons could be at once drawn to such a subject as this, with the result that much closer observation would be directed to the question of impairment of accommodation, or of general visual power, in connection with dental lesions.

There was one class of eye cases which was specially obscure. These were cases in which atrophy of the optic nerve on one side occurred without any apparent cause,—there was no evidence of any central lesion and no inflammation. Such cases were not very unfrequent, and they were very puzzling to ophthalmic surgeons. In future he should carefully examine the teeth; here was an evident possible cause, and he felt greatly indebted to Mr. Power for calling his attention to it. There were other affections of the eye, the etiology of which was somewhat obscure—as, for instance, glaucoma; but the cases of amaurosis to which he had referred had never been at all understood, and if it should be found possible to arrest their progress by extracting a few teeth, it would be a most important discovery. He could not say that he had himself ever met with disease of the eye due to dental irritation, but no doubt this had been owing to want of observation on his part. Now that attention had been specially directed to this connection, he had no doubt that many more cases would be put on record.

The following communication from Mr. SPENCE BATE, F.R.S., of Plymouth, was read by the Secretary:—

“Dear Sir,

“I should like to state that a few days since, I extracted some teeth with a view to relieving neuralgia in the eye. My diagnosis condemned the third upper molar on the same

side as the affected eye, but I also removed the first upper molar on the same side, and an under molar on the opposite, for hygienic purposes.

“The relief to the eye was early felt, and appears to be permanent.

“I am, dear Sir,

“Yours truly,

“C. SPENCE BATE.”

MR. S. C. GIBBONS, of Brighton, mentioned the case of a young lady, aged twenty-one, who had consulted him in October. She had then been suffering from impaired vision, almost amounting to blindness, for about eighteen months. She had been for some time under the care of an oculist, who said she was suffering from amaurosis, and who had been treating her with setons and blisters; under this treatment some improvement had been effected, but her sight was still very defective. Upon examination of the mouth he found both centrals and the right lateral incisor very much decayed and dead. These were extracted, and also, at different times, the four upper bicuspid, which were necrosed, and the roots of the upper first molars; in the lower jaw the stumps of the first molars were extracted. Several of the roots were considerably enlarged by exostoses.

After the removal of these teeth the patient's health improved very much, and there was a most marvellous improvement in the sight, which was now almost as good as ever; the sight of the left eye was, however, still weak, though the right eye was at one time the worst.

MR. W. A. HUNT (Yeovil) said he thought Mr. Power's cases might be conveniently divided into three classes. First, those in which failure of the power of accommodation was connected with diseased teeth; this had been noticed by many observers. Secondly, there were those in which local inflammation was excited, as conjunctivitis and phlyctenular ophthalmia; and, lastly, those in which general alteration of the nutrition of the eyeball resulted. These latter appeared to him the most difficult of explanation. Thus with regard

to glaucoma Mr. Power had quoted the experiments of two German observers who had found that irritation of the fifth nerve would increase the tension of the eye from its normal amount (1 inch of mercury) to the equivalent of as much as 8 inches of mercury. He could not at all understand how it could be that in a healthy eye, with the ordinary drainage arrangements in full action, irritation of the fifth nerve could possibly have such an effect as that described.

He quite agreed with what Mr. Macnamara had said with reference to the importance of the subject, and the necessity for more careful observation. If dental practitioners would only give a little attention to these matters, they would soon amass an amount of information which would bear rich fruit for future ophthalmic surgeons. Unfortunately, however, dentists did not often observe much beyond the limits of their own domain, and the reason of this was evident enough, viz., that their own work required such constant and close attention, and so completely engrossed all their faculties, that they had little opportunity for observing the condition of other organs.

MR. J. S. TURNER said he thought members would congratulate themselves on the opportunity which had happily been afforded them of discussing, or hearing a discussion on, Mr. Power's paper. It seemed to him, however, that the subject must after all be of interest chiefly to the ophthalmic surgeon. The dentist might supplement his information by pointing out conditions which might escape his notice, and might assist him in the treatment of cases, but the elucidation of the phenomena which Mr. Power had described lay chiefly within the domains of the oculist. The investigation of the phenomena of reflex action was, no doubt, common ground to both, but the frequent occurrence in Mr. Power's paper of explanation of such technical terms as hypermetropia, and of descriptions of the internal structures of the eye, showed that special knowledge and experience were required in dealing with such cases, and therefore they must be dealt with mainly by the oculist.

He had never to his knowledge met with any such cases as had been referred to by Mr. Power, nor in his own personal experience had he found that the extraction of carious teeth had been followed by improved vision; on the contrary, although he had lost a good many teeth, he found that his sight had rather deteriorated than otherwise. He could, however, confirm the observation of the French surgeon who had noted that odontalgia was often attended with lachrymation; he thought all dentists were well acquainted with that fact. Mr. Power's paper was one to be read carefully by all dental practitioners; he had himself been greatly interested by it. But as regards its practical application, he thought the initiation must generally come from the ophthalmic surgeon, and that it was chiefly valuable to them as reminding them of a possible cause for eye diseases which had been very generally overlooked, and as suggesting to them the proper course to take in obstinate cases.

MR. S. J. HUTCHINSON said he should be glad to have Mr. Power's opinion with reference to a case which he then had under observation. A lady came to him in October whose left upper eyelid was fixed *wide open*; this appeared to be due to a spasmodic contraction of the levator palpebræ. She could, however, by making an effort, almost close the eye. She said that in March last she was exposed to cold; this was followed by neuralgia of the left side of the face, and then this spasm of the eyelid came on, and had persisted ever since. On examining the teeth he found that both wisdom teeth on the left side were carious; the upper first molar on the same side was decayed, with exposed pulp, and the lower second molar was in the same condition. The only one of these teeth which had given her any inconvenience was the lower wisdom tooth, from which she had suffered some pain occasionally, but not very much. Thinking the spasm of the eyelid might be due to reflex irritation proceeding from the carious teeth, Mr. Hutchinson extracted all four of these, but without the slightest benefit to the patient. There was, apparently, nothing amiss with the other teeth except that

the upper second molar had been filled with amalgam, but there were no signs of irritation of the pulp, and as the patient, perhaps with reason, was unwilling to submit to any further experiments, he had not ventured to insist on the removal of the filling. Mr. Power had not mentioned any similar case amongst those referred to in his paper, and he (Mr. Hutchinson) should be glad if Mr. Power could suggest to him the probable cause of the spasm.

MR. J. B. SUTTON remarked that the connection between disease of the eye and teeth was not such a new discovery as some of the speakers that evening seemed to suppose. It had been known a long time, and many papers had been written on the subject. When he was attending the clinic of Professor Galezowski in Paris, in 1879, that eminent teacher lost no opportunity of impressing this connection on his pupils. He used occasionally to collect four or five cases of hypermetropia due to, or aggravated by, carious teeth, have the offending teeth extracted, and then demonstrate the consequent improvement in the sight.

MR. A. COLEMAN referred to a patient who had applied to him at St. Bartholomew's Hospital only a few days previously, complaining that his teeth were tender, and that for the last two or three weeks his sight had become affected. On careful examination, however, he was found to be suffering from malignant disease of the antrum. He thought dentists ought to pay greater attention to the condition of other organs than those with which they were immediately concerned. The time might come when ophthalmic surgeons might be able to throw some light upon dental science; it would be interesting, for instance, to ascertain, if possible, whether any connection could be made out between certain special diseases of the teeth and special diseases of the eye.

MR. STOCKEN mentioned the case of a lady who had suffered for eight years from epileptiform neuralgia affecting the left side of the face, and attended with lachrymation of the left eye. He examined her teeth very carefully, but could find nothing amiss with them. He then prescribed a

mixture containing gelseminum and aconite, which completely cured her. The origin of the neuralgia was therefore obscure, but he was not at all satisfied that it was not a reflex effect of dental irritation, although he had not been able to discover the exciting cause.

MR. SAVORY said he had perused Mr. Power's admirable paper with great interest. It gave support to a great and most important principle,—one which was constantly at work in all parts of the body, both in health and disease, viz., that intimate connection between distinct, and even distant, organs which was commonly referred to under the name of *sympathy*. As examples of physiological sympathy he might mention the relation between the uterus and mammæ, and between the testicles and larynx. Whilst other examples of sympathy were seen in the pain in the knee constantly met with in cases of disease of the hip, and the pain at the end of the penis which was characteristic of stone in the bladder. Yet the importance of this great principle was often not recognised, and he hoped that this paper would have the effect of calling renewed attention to it.

The effects produced upon distant parts by dental irritation belonged to this category. That irritation of the dental nerves might produce such effects had no doubt long been known, but few seemed to bear the fact in mind, and thus the real cause of the mischief was constantly overlooked. It was said that the late Dr. Baly first gained his reputation by curing a case of epilepsy, the cause of which—a splinter of wood impacted in a tooth—had escaped the observation of several well-known medical practitioners.

He was surprised to find so good a physiologist as Mr. Power speaking of sympathy and reflex action as though these were convertible terms. They really referred to two distinct things; in reflex action, the stimulus was communicated from a sensitive to a motor nerve, as in the case of strabismus due to dental irritation. But inflammation of the cornea due to the same cause was an example of sympathy. The distinction was not unimportant, but after all the great thing to remember was that the cause of disease

might be in one part of the body and the signs of it in another.

MR. CHAS. TOMES said there was one fact which impressed him in reading Mr. Power's paper, which had not yet been referred to in the course of the discussion. It had, he believed, generally been thought that remote nervous disturbance was more likely to occur where the living tooth pulp was irritated; but amongst Mr. Power's cases most were cases of dead teeth, in which the irritation was external to the tooth. It must therefore have acted directly upon the nerve trunk, which lay in close proximity to the roots of the teeth, and not upon its terminal filaments. He thought this was rather an important point, and one to which attention should be called.

He had himself been at one time the subject of visual disturbance due to dental irritation. It took the form of the very disagreeable sensation of looking through a film of running water. One eye only was affected; it was associated with supra-orbital headache, and he soon noticed that it occurred when some upper stumps on the same side became tender. As soon as he had clearly established this connection, he got rid of the stumps, and at once freed himself from the annoyance.

MR. STORER BENNETT remarked that the subject of Mr. Power's paper ought not to be altogether new to members of the dental profession, since reference to it was made in Mr. Salter's work, and by Mr. John Tomes in the first edition of his "Dental Surgery," in which several cases similar to those quoted by Mr. Power were brought forward. He wished to ask Mr. Power, with reference to the case of the patient who had glaucoma of both eyes, and who had several teeth extracted on account of alveolar abscess, if he could say whether the patient's eye symptoms were relieved either permanently or temporarily by these extractions?

With regard to the experiments of Von Hippel and Grünhagen on the great increase of the tension of the eyeball produced by irritation of the fifth nerve, he thought it was

very remarkable that this increase had not been noticed in some, at least, of the numerous cases of irritation of the fifth nerve which came under the notice of the dental profession, and he thought that if it did occur it could hardly fail to give rise to such symptoms as would certainly call attention to it.

The PRESIDENT having called upon the author of the paper for his reply,

MR. POWER said he would state at once that he had never laid claim to the slightest originality in connection with the subject of his paper. The facts therein mentioned had been known for the most part for years and years, as was plainly indicated by the dates of some of the cases. And had he had more time at his disposal, many more cases might have been collected.

It might, perhaps, be of interest if he were to point out the various ways in which diseased action might reach distant parts.

(1) In the first place, distant organs might be affected by *direct continuity of disease*, as in Mr. Coleman's case of cancer.

(2) Remote effects might be produced by *inhibition*. It was very difficult to explain the nature of this action, or even to say whether it was to be classed as reflex action or as sympathy.

(3) There was the *trophic* or *vaso-motor influence*; irritation of one nerve would exert an inhibitory influence on the vaso-motor nerves supplied to the branches of an artery going to a distant part. Glaucoma might, in some instances, be explained in this way. Irritation of the fifth nerve exercised a paralysing influence on the ciliary branches of the third nerve; the small vessels supplied by some of these were also paralysed, and a much larger quantity of fluid was secreted than could be carried off by the usual channels, and thus increased tension within the eyeball resulted. Increased tension would not, however, by itself produce glaucoma—there must be other factors present; but if the eye was ripe for degenerative changes, this would induce the onset of the disease.

Another example of this trophic change was the haziness and ulceration of the cornea, which might be produced by irritation of the fifth nerve, and no doubt the case of cataract related by Mr. Sewill at the last meeting belonged to this class.

(4) Remote effects might be produced by *extension of neuritis*. The neuritis runs up the nerve from the tooth, and is reflected back to the eye. Phlyctenular ophthalmia probably originated in this way, as microscopical investigation showed a continuous growth of nuclei along the course of the nerves.

(5) Lastly, they might be due to *reflex irritation or sympathy*. Thus a child about two years old was brought to him suffering from squint. Not being satisfied as to the cause, he gave a brisk aperient, and the mother informed him that a large ball of worms came away; the squint at once disappeared. Sir Benjamin Brodie recorded the case of a woman who suffered for a long time from severe pain in one knee, which resisted all treatment; at last a tooth became painful and was extracted, and the pain immediately disappeared.

He agreed with Mr. Turner that the subject was rather one for the consideration of ophthalmic surgeons than for the members of that Society; still a knowledge of the facts he had called their attention to might be of use to them occasionally.

The condition described by Mr. Hutchinson was that known as Lagophthalmos, and was probably due to spasm of the levator palpebræ due to some irritation of the third nerve.

He agreed with Mr. Savory as to the value of the distinction he had pointed out. As to Mr. Bennett's question, he was sorry to say that he had not thought of the teeth as a possible cause of the case of double glaucoma which he had related, until it was too late. Should such a case again come under his notice, he should be very careful to get the teeth carefully examined and attended to.

He thanked them very heartily for the way in which they had received and discussed his paper. Had he anticipated

that it would have occasioned so much interest, he would have taken greater pains in its preparation.

The PRESIDENT then proposed a vote of thanks to Messrs. Weiss, Sutton, and other contributors of Casual Communications, and especially to Mr. Power for the valuable information he had given them.

This having been carried with much applause, the meeting was adjourned.

Odontological Society of Great Britain.

ANNUAL GENERAL MEETING.

January 14th, 1884.

JOSEPH WALKER, M.D., PRESIDENT, IN THE CHAIR.

The Minutes of the previous meeting having been read and confirmed,

The PRESIDENT declared the ballot open for the election of the officers and Council for the ensuing year.

MESSRS. WILLIAM WEST and GEORGE HENRY were then chosen, in the manner prescribed by the Bye-laws, to act as Scrutineers of the Ballot.

MR. MORTON SMALE then showed models of a case in which the right upper canine had erupted into the right nostril. The patient, a girl, aged seventeen, applied to Dr. de Haviland Hall, at the Westminster Hospital, suffering from ozœna and general debility, the result of inherited syphilis. There was nothing specially interesting in the history of the case. She was admitted into the hospital, where her health greatly improved, and after keeping her under observation for a short time, the tooth was removed by Dr. Walker. The temporary canines were present in the mouth. The case had been brought by Dr. Hall before the Medical Society of London, where it appeared to excite great interest.

DR. WALKER remarked that it was difficult to imagine, without having seen the patient, how great a disfigurement was caused by this protruding tooth in the nostril. It was well

implanted, appearing quite firm to the touch, though easily extracted with the forceps. The periosteum appeared quite healthy.

In reply to MR. HUTCHINSON Mr. Smale said the tooth appeared to have given rise to no irritation whatever; there were no signs of periostitis or of abscess.

MR. STOCKEN showed models of the upper and lower jaws of a man, aged forty, which were interesting on account of their remarkable size.

The PRESIDENT remarked that they were certainly very fully developed; he did not remember ever to have seen larger.

MR. OAKLEY COLES asked whether the man had a large head, and whether he was of average intelligence.

MR. STOCKEN replied that the patient had rather a small head and long narrow face, the size of the jaws being quite disproportionate. He was, however, certainly not deficient in intelligence.

FINANCIAL STATEMENT.

MR. JAS. PARKINSON then read his report as Treasurer. He said the total receipts during the past year had amounted to £538 12s. 8d., and the total disbursements to £574 11s. 9d., causing a deficiency on balance of £35 19s. 1d. This result, so different from the balance sheets which he had had the pleasure of presenting for some years past, was accounted for by the unusual outlay which had been necessary in connection with the alteration of the premises during the past year, and especially by the expense incurred in fitting up their new library, which had amounted to nearly £200. It was, however, satisfactory to state that the invested funds of the Society had not been encroached upon. The whole of the necessary outlay had been defrayed out of the income of the year, with the exception of the small sum just mentioned (£36). The assets of the Society on October 31st last consisted of—

	£	s.	d.
New 3 per cent stock	1,299	14	3
Cash on deposit	550	0	0
Cash at Bank and in Treasurer's hands ..	425	11	5
	<hr/>		
Total	£2,275	5	8
	<hr/>		

He was sorry to have to report that 57 members were in arrears with their subscriptions, viz.: 16 resident, and 41 non-resident members.

Twenty-five new members had been elected during the year, viz.: 12 resident, 12 non-resident, and 1 honorary. There had been 4 resignations, all of non-resident members, and 5 deaths, viz.: 2 resident members, 2 non-resident, and 1 honorary. The Society now included 132 resident, and 201 non-resident, making a total of 333, together with 42 honorary and corresponding members. A detailed statement of accounts is subjoined.

*The Treasurer in Account with THE ODONTOLOGICAL SOCIETY OF GREAT BRITAIN,
for the Session ending 31st October, 1883.*

Dr.		£ s. d.		Cr.	£ s. d.	
To Annual Subscriptions	399 0 0	By Printing and Publishing the "Transactions," including	..	..
Entrance Fees	35 14 0	Postage	..	111 6 2
Arrears of Subscriptions	37 16 0	Sundry Printing..	..	14 10 6
Sale of "Transactions"	8 15 9	Reporting	..	23 2 0
Interest on Stock	37 7 5	Rent (one year)	..	86 5 0
Interest on £250 (one year)	17 17 6	Refreshments	..	26 10 9
Interest on £200 (deposited six months)	2 0 0	Gratuity to late Porter	..	20 0 0
Cash over-paid Librarian	0 2 0	Library, Museum, and Council Room..	..	228 9 1
Cash at Bank and in Treasurer's hands 31st October,			538 12 8	Postage and Receipt Stamps	..	7 0 0
1882	461 10 6	Purchase of Stock	..	37 7 5
Cr.			1,000 3 2	Sundries	..	20 0 10
By Expenditure	574 11 9			
Cash at Bank, and in Treasurer's hands 31st October,						
1883	£425 11 5			

MORTON A. SMALE
WILLOUGHBY G. WEISS

JAS. PARKINSON,
Hon. Treasurer.

£574 11 9

The PRESIDENT said that, owing to forgetfulness on his part, no auditors had been appointed at the December meeting, and Mr. Parkinson's accounts, although undoubtedly correct, had not been formally certified as required by the Bye-laws. He therefore suggested that the auditors should be at once appointed, so that the balance sheet might be duly examined, and signed by them previous to its publication in the "Transactions."

On the motion of MESSRS. HUTCHINSON and OAKLEY COLES, Messrs. Morton Smale and Willoughby Weiss were accordingly chosen to audit the accounts of the past year.

Mr. S. J. HUTCHINSON (Curator) reported that a great many very interesting specimens had been added to the Museum during the past year, and had been brought before the notice of members at the ordinary meetings. Considerable alterations had also been made in the arrangement of the Museum, by which a good deal of additional space had been gained. With the sanction of the Committee of Management of the Hospital, cases had been placed in the Dean's room, and in this the Comparative Anatomy specimens had been arranged. It had been decided to defer the publication of the supplemental catalogue for a time, in the hope that members would, by a continuance of their present liberality, fill up with fresh specimens some of the vacant space now ready for occupation.

Mr. OAKLEY COLES suggested that Mr. Hutchinson's appeal might be better responded to if the members generally knew in which departments of the Museum additional specimens were most wanted.

Mr. HUTCHINSON replied that he should be glad to receive additional specimens of comparative dental pathology. A series of models of good regulation cases, accompanied by the apparatus used, would also be very acceptable.

Mr. WILLOUGHBY WEISS said the collection of cleft palate cases was not quite as complete as could be wished. All the

specimens at present in the Museum, with two or three exceptions, had been presented by Mr. Oakley Coles.

MR. COLEMAN said that if some of the specimens could be arranged in series, it would be a great advantage to the lecturers in illustrating their lectures. Thus he should like to see a series of specimens illustrating the progress of dental caries, and one showing the process of absorption of teeth, temporary as well as permanent.

MR. HUTCHINSON said there were in the Museum some very remarkable cases of absorption of permanent teeth, though they had not been arranged in a series. He would see what could be done to meet Mr. Coleman's suggestion.

MR. FELIX WEISS then made the following report with reference to the condition of the Library.

"It is with great satisfaction that I call attention to the improvements made in the Library; not only are the books better displayed and got at more easily, but every facility is now given to those members who desire to make use of the new room for the purposes of reference, and it cannot be too distinctly noted that it is always open on Wednesday evenings from 6 to 8.

"The additions that have been made to the Library are not very numerous, but every care has been taken to add copies of all new books, and to keep up the serials connected with our profession. We have had 24 members of the Society making use of the library, and 46 students, the books borrowed amounting nearly to 100 volumes. All this is very satisfactory, but I am sorry to say that a few books are missing. During the period that the Library was undergoing alterations, and before the present porter, who acts as sub-librarian, was thoroughly acquainted with his duties, books were borrowed irregularly, and it has come to my knowledge that students have sometimes left this Institution without returning the books lent to them. It cannot be too widely understood that the privilege of borrowing books extended to the students attending the Dental Hospital is only a conditional one,

and these books are lent as books of reference, and not for the purposes of continuous study, and they can only be kept two weeks. Books must be returned to the sub-librarian, and not handed from one to another. In the next number of the 'Transactions' a slip will be inserted giving the names of these missing volumes, and if they be in the hands of any of the members, I should feel greatly obliged by their being immediately returned."

The PRESIDENT then called upon Mr. J. Bland Sutton to read his paper on "Comparative Dental Pathology."

Comparative Dental Pathology.

By JOHN BLAND SUTTON, Lecturer on Comparative Anatomy,
&c., Middlesex Hospital Medical College, London.

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 3. Abnormalities of Growth.
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 5. Diseases of the Teeth.
 6. Fracture of Teeth.
 7. Parasites.
 8. Foreign Bodies in Teeth.
 9. Summary.
 10. Bibliography.
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INTRODUCTION.

SCATTERED chiefly among anatomical literature are numerous cases illustrating diseases of the dental tissues in animals, of no small importance and value. Aware of the interest this Society has shown in these matters, I deemed it would be profitable labour to collect all recorded cases of "diseases of the teeth in animals," and add to these a notice of some instances of more than ordinary departure from the normal condition of teeth of certain wild animals which have come under my observation, and place them before the

Society in a collected form, arranged in such a manner as our present limited knowledge of the subject admits.

My first intention was to include "malformation and diseases of the jaws," but this embraced a field of greater extent than could be consistently dealt with in one evening. I therefore contented myself with treating of the malformations and diseases of the dental armature alone, leaving the jaws to form the subject of a future communication.

It is satisfactory to note that, though I have searched far and wide, one of the most fruitful places for papers on Comparative Dental Pathology has been the Transactions of this Society; I would refer particularly to the papers of Professor Flower, Dr. Murie, and Mr. Tomes. Dr. Magitot's "*Traité des Anomalies du Système Dentaire*" furnished some good material; other matter has been gleaned from the most varied sources. At the end of this work, in the form of a Bibliography, care has been taken to note in all instances the place of record and the recorder of the case or cases referred to.

In classifying the diseases it seems most satisfactory to arrange them in the following order:—

- (1) Malformations, including under this term abnormalities of number, shape, size, and situation.
- (2) Abnormalities of growth. This treats of

hypertrophy, atrophy, arrested and aberrant growth.

- (3) Constitutional diseases affecting the teeth, such as mollities ossium and rickets.
- (4) Diseases of the teeth. This will comprise caries, erosion, inflammation of the pulp, alveolar abscess, and odontomes.
- (5) Fracture.
- (6) Parasites attacking teeth.
- (7) Foreign bodies in teeth.

Under one or other of these headings will be arranged all affections of the teeth of animals, from whatsoever cause arising. It seemed to me better to make my divisions as comprehensive as possible, rather than to split the subject into many minor subdivisions, as is so customary with the majority of authors writing on special matters. It is preferable to err on the side of limited division, than to create a host of minor classes of affections, which are admirably suited to perplex and worry the reader. The order followed is nearly the same as that observed in Tomes' "System of Dental Surgery," 2nd edition.

CHAPTER I.

MALFORMATIONS.

THIS chapter deals with anomalous forms of teeth, abnormalities in number, deviations in size, and irregularities in their position.

1. *Duplicity or Fusion*.—The Teratological series of the Museum of the College of Surgeons, London, (1), possesses an excellent example of this malformation in an elephant's tusk, which is double. Some have supposed this to be due to injury of the growing pulp, but I think this condition receives a ready explanation when we reflect that the papillæ of the skin are frequently double, and as teeth are modifications of similar papillæ, it seems strange that bifid teeth should be so infrequent.

Magitot (2) figures a case of fusion of two incisors of a horse; the specimen is in the museum at Alfort. It consists of a second left incisor, united with a supernumerary tooth. And at the last meeting of the Society, Mr. Wilson, of Edinburgh, exhibited a similar abnormality in the teeth of a frugivorous bat (*Pteropus*), the united teeth being also a lateral and a supernumerary incisor.

2. *Malformation from Injury*.—Worthy of attention are the spiral elephants' tusks deposited in the Museum of the College of Surgeons. These tusks, instead of presenting an uniform circum-

ference, are spirally twisted, the twist possessing in some instances two or more turns, a deep groove starting from the basal portion of the tusk, and extending to its apex, clearly explains the cause of the malformation, viz., injury to the formative pulp when the tooth was in embryo, causing it to grow unequally. None of these malformed tusks attain to a great length. These tusks have been carefully described by Professor Flower (4).

3. *Abnormalities of Number*.—Variations in the number of the teeth of animals are encountered chiefly in the permanent dentition; indeed, concerning the milk teeth in all classes of animals, positive information is meagre.

Anomalies of number chiefly affect the molar teeth. Magitot records instances of supernumerary molars in the gorilla in three cases. The same author has met with additional molars, and, in one instance, an additional incisor in the spider-monkeys, also a supernumerary molar in a sapajou.

Dogs, too, are subject to additional teeth in the molar set. They have been encountered in the rabbit, and Blandford (3) has placed on record a supernumerary tooth in the case of a hyrax, an old female. "The extra tooth was situated at the posterior end of the molar series, on each side of the upper jaw."

Magitot has collected five examples from the

horse of supernumerary incisors ; the same anomaly has been met with in the sheep, and in the molar series of sheep, and in a bullock.

Professor Flower has recorded an example in the seal. "It had a small molar in addition to the usual number of five, behind the last on the left side of the upper jaw, and another on the inner side of the fifth in the lower jaw, also on the left side, each being a miniaturer epresentative of the ordinary molar tooth."

I. Geoffroy Saint-Hilaire, in his "Anomalies de l'Organisation," Tom. I, gives some interesting accounts of supernumerary teeth in horses, dogs, monkeys, and marsupials, affecting chiefly the molar teeth.

4. *Irregularities of Position*.—The museum at Alfort possesses a remarkable example of deviation in position. It is a skull of an adult horse, with a molar tooth situated at the base of the petrous portion of the temporal bone. The same museum also contains an example of a molar tooth in the cranial cavity of a horse killed at Alfort, 1849. According to the drawings given in Dr. Magitot's work (Plate IX, figs. 1, 2, 3), these abnormal teeth seem to occupy the posterior part of the space between the petrous and squamous portions of the right temporal bone. The mouth in both these cases contained the correct number of permanent teeth, consequently these abnormal ones were

examples of supernumerary teeth. I think it would be better to regard teeth in this situation rather as examples of dermoid cysts containing teeth than as true examples of supernumerary teeth.

Professor Flower mentions two cases of irregularities in the position of teeth. The first concerns an orang. In this case the upper canine was in contact with the second molar, thus displacing the first molar forwards. The second case occurred in a vervet monkey. The lower canine lodged within the upper one, so that the apex of the tooth was received within a cavity in the alveolar border.

The accompanying figure represents the upper dental arch of a marmot, in which a tooth resembling a molar has developed on the hard palate on the inner side of the alveolar arch on each side (fig. I).

There is a specimen in the Museum of the Middlesex Hospital of the skull of a wild boar, in which the lower jaw having been broken had firmly united, but the two posterior molars of the left side are displaced inwards to the extent of half an inch. Magitot also figures the skull of a chimpanzee, in which the lower incisors close in front of the upper ones, such as occurs in certain specimens of fancy dogs, so commonly seen in this country—not the result of natural selection, but of a curious freak exhibited by dog-fanciers to perpetuate this deformity.

5. *Abnormalities of Direction*.—Professor Owen, in his “Odontography” (7), speaks of anomalies in the direction of elephants’ tusks (Indian). “As when one tusk is horizontal, the other vertical. The tusk of this animal is slightly moveable in its socket, and readily receives a new direction of

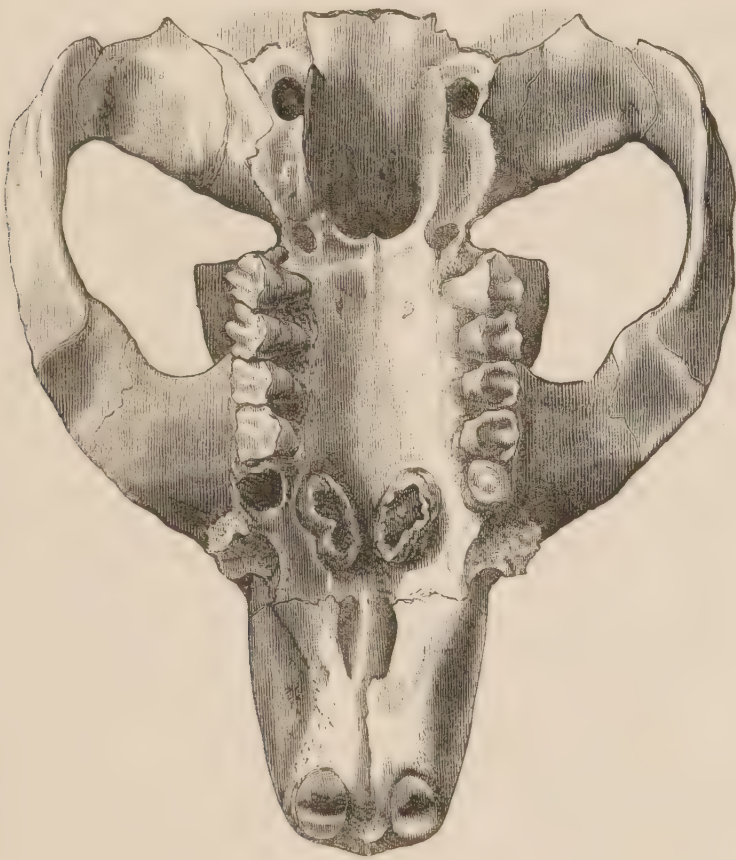


FIG. I.

growth from habitual pressure; this often causes distorted tusks in captive elephants, and Cuvier (26) relates the mode in which advantage was taken of the same impressibility, in order to rectify the growth of such tusks in an elephant kept at the Garden of Plants.”

This mobility of the tusks in their sockets may explain the abnormal direction of the canines in the babirussa when kept in captivity. Several instances have occurred in which the curiously curved canines, from whence it takes its native name of "*deer hog*," have converged to the median line of the head, and, penetrating the hard skull, killed the animal.

During the past summer some very fine specimens of this animal arrived at the Zoological Gardens, where it was noticed that in one of them the teeth were adopting the course just described. The two canines had encountered one another in the median line, and extended themselves backwards in close contact, the opposed sides becoming flattened, and their apices were just entering the frontal bone, an indentation about a quarter of an inch deep was excavated in the tough skin. Fortunately the mischief was detected in time; the animal was thrown, and the aberrant tusks were shortened some two inches. It must be obvious that if this abnormal growth, or rather direction, of the teeth was common in the wild state all the best males would be exterminated; for it is certain that the more vigorous the male the more developed his tusks, and, to a certain extent, the greater his monopoly of the females. Is it not possible that when confined in a limited enclosure the creature rubs his tusks against the sides of his prison, thus

impressing an abnormal direction to the growing tooth? That these animals do like to rub their heads in this way is attested by the following facts. A babirusa, previously captive in the Zoological Gardens, became so tamed that the keeper made a pet of it, and would play with the animal in its dwelling. One of the favourite habits of the creature was to rub its tusks against the keeper's legs, until they became as polished as an ivory ornament fresh from the turner's lathe. These teeth also took a false direction, and would have penetrated the beast's skull had they been permitted. Mr. A. D. Bartlett, to whom I am indebted for these facts, and who also allowed me to examine the polished fragments of the canines, found it necessary to remove from time to time portions from the extremities of the aberrant tusks. They were cut three times, the pieces removed measuring, on an average, an inch and a half each.

The most remarkable example of abnormality of direction taken by teeth that I am acquainted with is the specimen figured by Cheselden, in his "Osteographia," 1733, the original of which is in the Museum of the College of Surgeons. The specimen consists of the fore part of the lower jaw of a boar. It contains the incisors, canines, and premolars. The lower canines have from some reason or other grown excessively, turned back-

wards, and re-entered the mouth by piercing the integument and the substance of the jaw itself. The right tusk has tunnelled the bone for a distance of about 3 inches and reappeared on the floor of the mouth near the symphysis. The left tusk, after re-entering the mouth, seems to have passed across the buccal cavity, so that its apex is resting on the inner side of the right lower jaw.

The Museum of the Odontological Society possesses some interesting examples of tusks of the hippopotamus, which have formed a circle, and in one instance the point of the tooth has re-entered the pulp chamber. This specimen is the one figured in Tomes' "System of Dental Surgery" (27).

There are several other examples in the same museum of overgrown and curved teeth of rodents which have lost their antagonists. These specimens are chiefly from rabbits.

CHAPTER II.

ABNORMALITIES OF GROWTH.

IN this chapter it is proposed to deal with irregularities of growth in the following order:—

(1) Excessive growth, or Hypertrophy; (2) Arrested development; and (3) Atrophy.

It rarely happens that the two extremes of

growth, *excessive* and *arrested*, occur in the same individual, and in the same series of organs, to such an extent as that presented by the male narwhal (*Monodon monoceros*).

In this singular creature, the adult male usually possesses a tooth growing from the left maxillary bone, in close relation to the maxillo-premaxillary suture, and therefore regarded as a canine, which often attains to the length of 8, 9, or even 10 feet, with a basal diameter of 4 inches. The corresponding tooth of the opposite side usually undergoes development up to a certain point, attains a size perhaps of 6 inches, but its pulp chamber undergoes calcification before it has time to make its way out of the alveolus, so that it remains concealed from view throughout the lifetime of the animal. Occasionally, however, this right tusk undergoes development, and attains to the size of the left one. Mr. J. W. Clark (10) has investigated this question of two tusks, and has given a *résumé* of the matter in "Proceedings of the Zoological Society," 1871. He states that eleven bidental skulls of this animal exist in different European museums. He further states that the right tusk is never developed alone: when a single one is present it is always the left, although some very excellent books possess figures of a right solitary tooth. Professor Turner has noticed the existence in the foetal narwhal of two rudimentary

teeth, all traces of which are lost in the adult skull. Another point of interest in connection with these teeth is the spiral which winds round them from right to left. In speaking of the spiral elephant's tusks it was noticed that the deformity was the result of injury of the growing pulp; it is a remarkable fact that the skull of the narwhal presents a singular asymmetrical condition, so that the facial portion of the skull appears distorted; and it is a noteworthy fact that when two tusks develop, the twist of the spiral is in the same direction in both, as regards the skull—right to left—whereas they appeared unsymmetrical in respect to one another.

Contemplated from a pathological standpoint, these teeth are intensely instructive; though now the normal condition for this creature to possess a single elongated tusk, we can but regard it as an enormously hypertrophied tooth put to some use, probably essential to the well-being of its possessor. Whilst the stunted, rudimentary denticles noticed by Professor Turner indicate atrophy, whereas the tusks of the female and the right one of the male, concealed within the alveolus, their pulp chambers obliterated by secondary dentine, furnish excellent examples of arrested growth, and the spiral turn depicted on the overgrown tusk speak plainly of the malformation due probably to some disturbance of the formative pulp whilst the

animal was yet in embryo. I know of no parallel to this in the animal kingdom—extreme hypertrophy, excessive atrophy, arrested growth, and malformation, exhibited in the dental armature of a single animal.

Excessive growth.—As might be expected, the majority of cases illustrating excessive growth occur in animals whose teeth grow from persistent pulps; consequently the rodents furnish the most extensive series of cases in this respect. The abnormalities due to overgrowth of the teeth may be conveniently divided into two classes:—

(1) EXCESSIVE GROWTH WITH NORMAL ANTAGONISM OF THE TEETH.

(2) EXCESS GROWTH THE RESULT OF LOSS OF ANTAGONISM OF TEETH.

It is a well-known fact that the growth of the incisor teeth in rodents is unconditional; if their edges are not kept in check by constant usage they may give rise to all sorts of serious consequences. The teeth of a beaver in the Zoological Gardens grew to such an extent that the animal could no longer open its mouth, and in order to prevent its dying from starvation, the creature was slung up and an inch of each scalpiform lower incisor was removed, much to its comfort and well-being. Dr. Murie recorded a similar operation which was conducted on an alpaca, but expresses some surprise “that the teeth

should continue to grow after being cut in this unceremonious manner." Of course this event is not at all astonishing, provided the pulp cavity be not disturbed. I have now observed several cases in which the above operation has been performed more than once on the same animal; indeed we cannot regard the action in any other light than that it is equivalent to cutting the hair on a horse's tail.

As long ago as 1822, Oudet, in a paper referred to by Goubaux (12), performed some experiments to show that a rabbit's teeth grow after being cut. He wrote as follows:—"If a molar or incisor tooth belonging to a young or old rabbit be cut to the level of the gum, this tooth will, after some days, assume its former length." The experiment was repeated many times upon the same tooth, and with the same result. The animal having been killed some time after, the two corresponding teeth were examined and compared, and in each case there was the same length of tooth in the alveolus. The original paper is published in "L'Académie Royale de Médecine," le 23 Juillet, 1822, under the title of "Expériences sur l'accroissement continué et la reproduction des dents chez les lapins," &c.

Dr. Murie's (11) case of the aye-aye (*Cheiromys*) is also an admirable example of overgrowth in teeth which possess opponents. Careful inquiry into this question of overgrowth of teeth occurring

in captive rodents, has convinced me that it is not only diminished usage, but also luxurious living, that contributes to this excessive growth. It is well established that animals in captivity grow fat, and in many cases those born in captivity exceed in size those brought forth in the wild state. It is so with rabbits, and also with regard to lions and tigers ; it stands to reason that an animal with its food ready to hand shall grow fatter than one who has to hunt and exert his physical powers to obtain its necessary quantity of aliment ; it may not be so healthy, but it grows and increases in size in greater proportion than its wild brother ; and that the teeth should share in the general increased rate of growth is not to be wondered at. A striking case in confirmation of this view was mentioned to me by Mr. Charles Tomes. In one of the agricultural papers it was noticed that a question had been raised concerning the age of some prize pigs ; the point urged was that the animals' teeth did not correspond with their reputed age, and evidence was adduced to show that teeth appear earlier in pigs which are undergoing the fattening process.

Fig. II illustrates an instance of overgrowth in the tusk of a Corean pig, which is of interest, not so much from the fact of its having exceeded the normal dimensions prevailing in these animals, but that the root of the tooth had grown in the

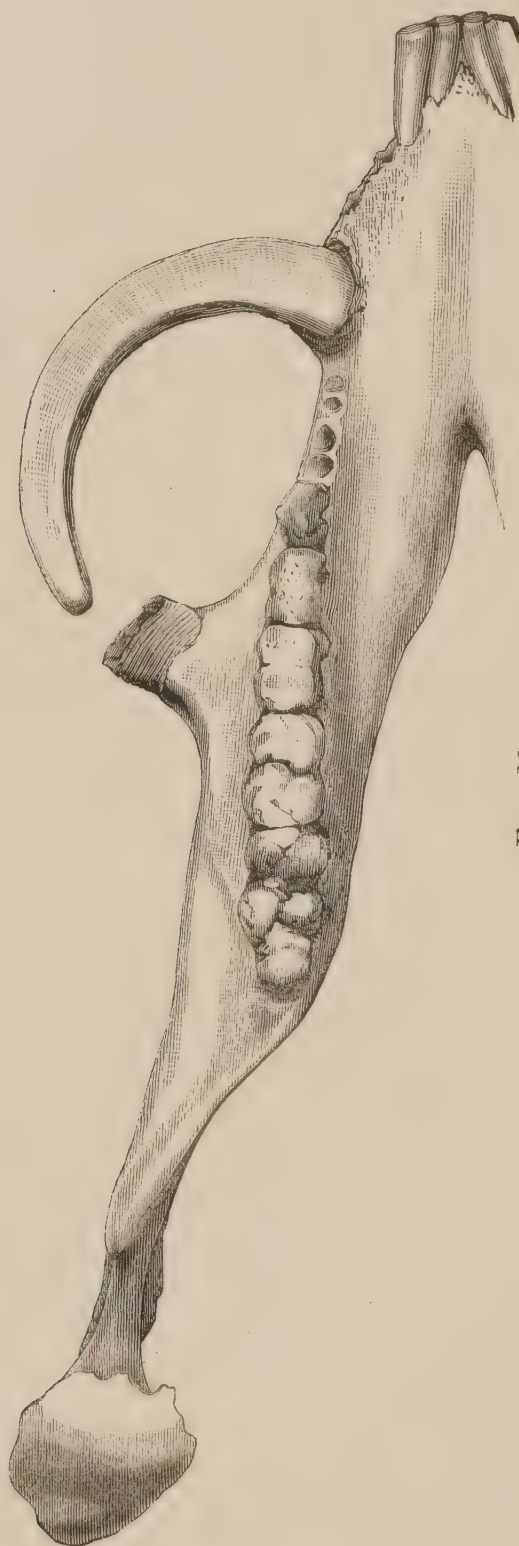


FIG. II.

contrary direction, expanded the bony tissue of the jaw, and formed a tumour on the outer surface of the inferior maxilla. The tumour was at first thought to be an exostosis, but on breaking away the thin shell of bone covering it, every one was surprised to find the open fang of the tusk projecting into the tumour. There was a similar condition on the other side.

Fig. III illustrates a condition of things which seems to me to be unique. The drawing represents the incisors of a male coypu rat which was suffocated by the pressure of a large cystic bronchocele. The teeth are very much overgrown, but the noteworthy points in the case are these. About three weeks before its death an accident occurred by which the right upper and the left lower tooth were broken; this naturally caused the left upper and the right lower teeth to want opponents, but, singular to relate, the two remaining teeth have grown in such a manner that they antagonise one another perfectly, and all this modification was effected within twenty-one days.

I must now pass on to consider the second class of cases, viz., *those in which the excessive growth results from loss of antagonism*. Examples of this class are exceedingly numerous.

Professor Owen (13) mentions the case of a rabbit in which the incisor of the lower jaw was broken, the upper incisor turned a complete circle and re-

entered the animal's palate. Also the case of a beaver, in which "the scalpriform incisor has, by unchecked growth, described a complete circle ; the

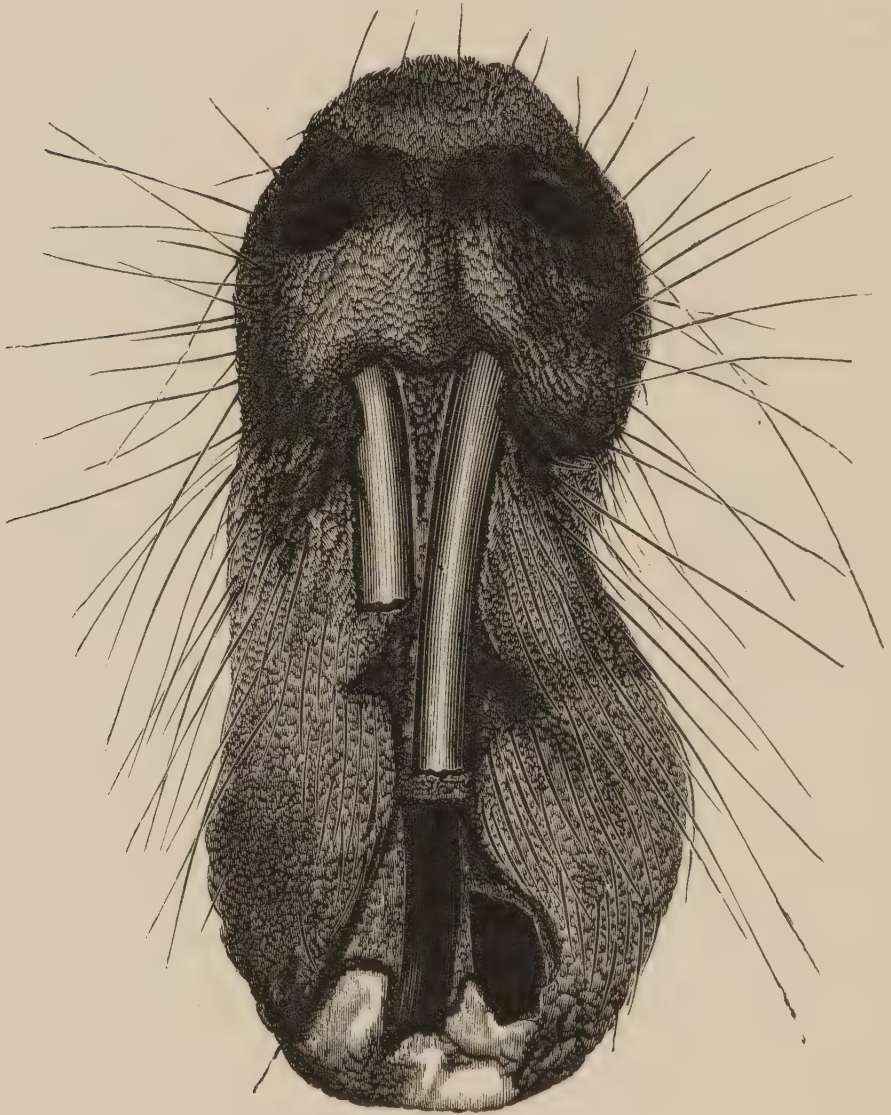


FIG. III.

point had pierced the masseter muscle and entered the back of the mouth, passing between the condyloid and coronoid processes of the lower jaw, descending to the back part of the molar teeth, in

advance of the part of its own alveolus which contains its hollow root."

Other instances have been recorded where the point of the abnormal tooth has described a complete circle and re-entered the pulp chamber. The suffering set up by such irritation as this must be beyond imagination. The curious fact in all these cases is that the abnormal teeth always tend to describe circles more or less complete. It is obvious that this curved condition of the elongated tooth is the direct result of the depth of the socket ; but whether they are curved in this way to protect the growing pulp from direct pressure, as some have supposed, I will not pretend to argue ; but certain it is that in many instances it is attended with the most deleterious consequences to the bearers of such teeth. (Similar cases were noted in Chapter I, page 96 *et seq.*)

Not only do rodents, and other animals whose teeth grow from persistent pulps, suffer from loss of opposing teeth. I have seen a similar thing occur in ruminants. A molar of the upper jaw becomes defective or carious ; the corresponding tooth in the lower jaw increases in growth to supply the deficiency. Dr. Murie has figured a case of this nature in his paper before alluded to. It occurred in a goat (*Capra hircus*). We are also familiar with the same thing in man. The same thing may be observed in the ass whose case is related on page 113.

Goubaux (12) has attempted to explain some cases of abnormal growth in rodents, by showing that there often exists in these animals a lateral deviation of the superior maxilla of one side. But his explanations are not very convincing.

This subject cannot be passed over without allusion to the affection of the teeth met with in rabbits whose cranial nerve has been severed in experiments conducted on that nerve by dividing it in the skull. Claude Bernard (28) first drew attention to the subject in his celebrated "Leçons."

I am not aware of its mention in English text-books, but Flint (14) gives an account of it :—

"In dividing the fifth cranial nerve it is impossible to avoid the small motor root; consequently the muscles of mastication become paralysed by the operation."

"In rabbits the paralysis of the muscles of mastication on one side, and the consequent action of the muscles upon the unaffected side only, produce in a few days after the operation a remarkable change in the appearance of the incisor teeth. As the teeth in these animals are continually worn away in mastication, and reproduced, the lower jaw being deviated by the action of the muscles of the sound side, the upper incisor of one side and the lower incisor of the other touch each other but slightly, and the teeth are worn unevenly. This makes the line of contact between the four

incisors when the jaws are closed oblique instead of horizontal."

Atrophy.—I have met with a curious instance of atrophy of the teeth in a reptile—a python. On opening the mouth of the snake after death, I was surprised to find that on passing my finger over the buccal mucous membrane no teeth could be felt, the mucous lining of the mouth was so thick that the ridges usually found between the two sets of teeth were obliterated. On dissecting the mouth I found some teeth still persistent, for the most part very small, entirely useless for retaining prey, and very many of them left their sockets as I detached the membrane covering them. I cannot give any explanation of this condition, except age; the snake had been in the Zoological Gardens some considerable time.

Professor Turner (15) observed an extreme case of atrophy in the skull of a grey seal (*Hydrochoerus gryphus*). The animal was caught near Montrose. No teeth were present in the upper jaw except the pair of canines, which were well developed, and occupied their usual position. No alveoli existed in the upper jaw except those in which the canines were lodged. There was complete absence also of teeth and alveoli in the lower jaw, except the pair of canines and the sockets in which they were lodged. Whether the case was one of premature atrophy or non-development of the teeth, it is difficult to state.

CHAPTER III.

CONSTITUTIONAL DISEASES AFFECTING TEETH.

I WISH to notice under this division of my subject a curious cause of premature shedding of the teeth, although it does not come strictly within range of the term atrophy of teeth, for the condition is brought about by atrophy of the alveolus, with the teeth still *in situ*, consequent on constitutional disease. Nevertheless I shall give an account of the phenomenon here, for it may possibly help to explain some cases of edentulous jaws in animals. Let me record the following case by way of illustration:—

This specimen is the skull of the racoon-like dog (*Nyctereutes procyonides*). The animal was affected by that singular disease, *mollities ossium*. The malady has not spared a single bone; they are all curved and twisted, and, now that they are macerated and dried, as light as cork. The alveolus has undergone absorption to such an extent that the fangs of the teeth stand “high and dry” for a considerable extent above the bony margins of their sockets, so that when the skull was macerated, several of the teeth came away with the buccal mucous membrane. The teeth which still remain possess sockets only half as deep as they should be, in the natural condition,

or to accommodate the teeth still sticking in them. A glance at the upper jaw shows the extent of the absorption, for the alveolar arches and the hard palate form a perfectly level surface. This state of things is by no means uncommon, particularly among carnivorous animals. I am not aware that any writer has noted the condition of the teeth and jaws in cases of *mollities ossium* occurring in the human subject, and I have not had much opportunity of seeing cases of this formidable malady. Fortunately it is a very rare affection, but I believe dental surgeons are acquainted with a peculiar form of shrinking of the alveolus which occurs without any particular condition of the constitution being associated with it. Possibly there may be some such constitutional state connected with it, but I would be understood to express myself cautiously on this point—it is merely a suggestion at present.

In the spring of 1882 I found a well-marked example of this disease in a monitor lizard: all its bones were so soft at the extremities that they could be impressed almost as though they were soft gutta-percha. In this case the teeth also shared in the general softening; they could be bent backwards or forwards in the jaws as though they had been decalcified in hydrochloric acid, and many of the teeth had fallen out.

Rickets.—It has long been recognised that in

children affected with rickets the teeth are generally late in making their appearance above the gums. Little attention has been directed to this subject beyond the observations of Mr. Shaw, who, in his valuable and oft-quoted paper in the "Med. and Chir. Soc. Transactions," suggested that the cause of the delay depended on the fact "that the jaws in rickets were usually small and dwarfed, whereas the teeth were of usual size ; so that the disease caused a disproportion in the relative size of the two structures." Last winter (1883) I exhibited at the Pathological Society numerous examples of rickets in monkeys. In many of these specimens I exposed the developing teeth, and found the tooth sacs extremely thickened, instead of being thin, delicate, and almost transparent, they were thicker than the skin on one's finger.

The specimen shown is an instance of rickets occurring in a lion ; although the animal is nearly full grown, the teeth in the upper jaws are only just appearing. The outer plate of the maxillary bone has been dissected off in order to determine the condition of the dental follicles. In the case of the canine, the fibrous envelope was nearly as hard as gristle, and instead of being almost imperceptible, actually creaked under the knife like cartilage. Whether this thickening of the capsule is sufficient to explain the delay in teething so

generally associated with pronounced cases of rickets in human beings, I must leave it to those practically acquainted with these matters to determine.

CHAPTER IV.

DISEASES OF THE TEETH.

THE subjects treated in this section deal with caries, erosion, attrition, inflammation with abscess of the pulp, and odontomes.

Caries.—As far as I have been able to ascertain, caries is by no means so frequent in animals as in man, and what must be considered important is the fact that carious teeth are far more common in domesticated than in wild animals. Most have, no doubt, seen cases of caries in horses. I have in my collection the skull of an ass, with three of the teeth attacked by caries, one of them being completely destroyed with the exception of the fang. The remaining teeth are very irregular in size, and where gaps exist in the upper series, the corresponding teeth in the lower set have elongated to supply the deficiency. Dr. Magitot mentions the occurrence of caries in the teeth of anthropoid apes. The Odontological Society's Museum has a specimen illustrating caries in the tooth of a sperm whale, in which the pulp has

become exposed, ending in abscess. I have met with instances of this affection in a crab-eating racoon, three of the molars being rather severely attacked, and in other carnivorous animals kept in confinement. The lion whose case was described in the last chapter had a decayed last molar on the right side. Last winter an example of caries came under my observation in a kangaroo, three of the molars being affected.

Erosion.—This seems the most suitable place to mention erosion of teeth, of which condition a very striking example was described and figured in the Transactions of this Society, by Dr. Murie, in the case of the sea lion (*Otaria jubata*) brought direct from the Falkland Islands (fig. IV). In this instance, not only the whole of the smaller-sized molars and premolars, but also the great canines of both the upper and lower jaws, were worn in a circular or grooved manner, as if compassed by a ring in their middles. The canines were not completely furrowed round, but rather deeply excavated behind. The tips or crowns of both canines and grinding teeth were ground down and flattened to a certain degree only. The worn surface was blackened, smooth, and highly polished. Dr. Murie found only one other case in many seals he examined. No satisfactory explanation has been advanced as to the cause of this singular condition. I have entered into details concerning this case as

it is a very important one, inasmuch as it showed clearly enough that erosion in human teeth did not result from the excessive use of the tooth-brush as many maintained.

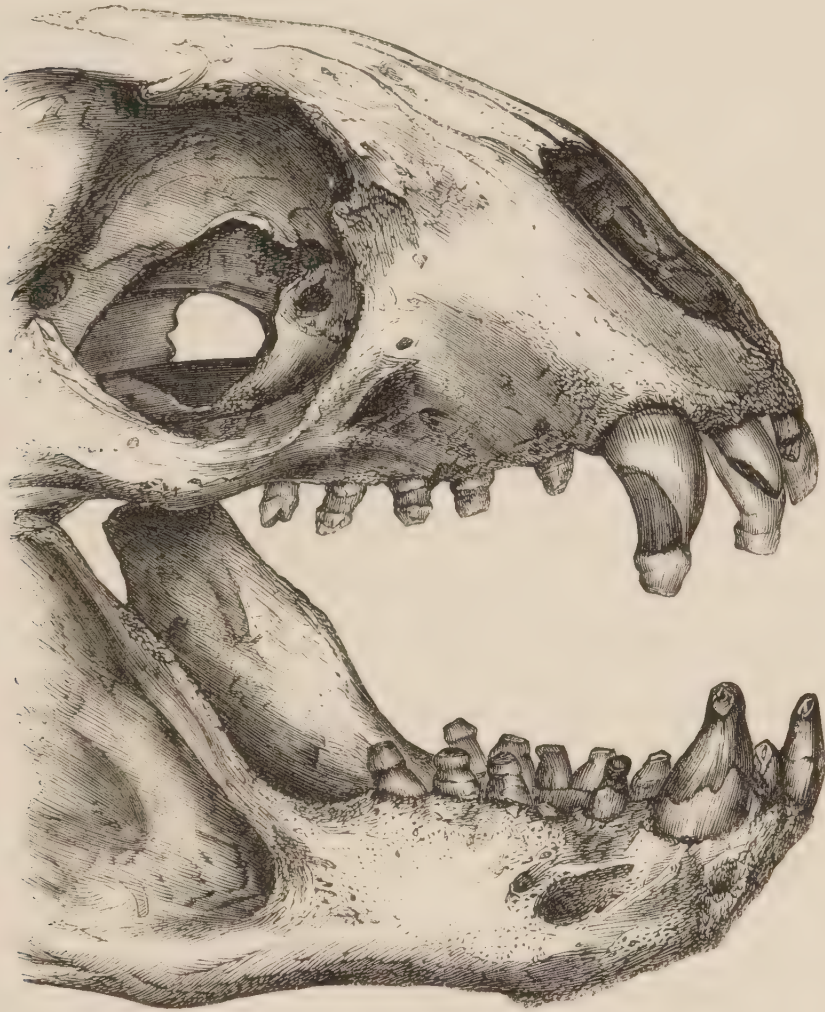


FIG. IV.

Dr. Murie's communication was made to the Society in 1870. Since then Dr. Magitot has published his work on "The Anomalies of the Teeth in Man and Animals" (1877), in which he

mentions the subject of erosion, but seems to be unaware of Dr. Murie's paper. He mentions how excessively rare the occurrence of erosion in animals is, and records only one example. This concerns the teeth of a cow observed by M. Goubaux. The specimen is in the museum at Alfort, and is thus described by Magitot: "The animal was two years and a half old; it had four teeth of the second, and four of the first dentition. The anterior face of the two central incisors presents a deep transverse furrow entirely horizontal, situated at the upper third of the crown, and at an equal level for the two teeth. The other teeth do not present anything analogous." Fig. V represents the condition as figured in the work mentioned.

Abscess of the pulp in whales (16).—It appears from the researches of Eschricht that a certain species of whale (*Orca*) is liable to a singular affection of the teeth, due to friction. It is a well-known fact that the teeth of the sperm whale, or cachalot (*Physeter Macrocephalus*), consist of a hollow cone of dentine coated by cement, containing in its interior osteo-dentine, irregular masses of which have been found loose in the pulp-chamber.

According to the observations of Eschricht, the teeth of the Orcas resemble those of the cachalot, inasmuch as they represent a curved cone with an

obtuse point, and a comparatively broad base, only it is most commonly somewhat compressed, having two indistinct margins, an exterior one convex, and an interior one concave. But more minutely examined, especially when cut through transversely, it is observed to have quite a different structure ; for whereas the cachalot's teeth only consist of

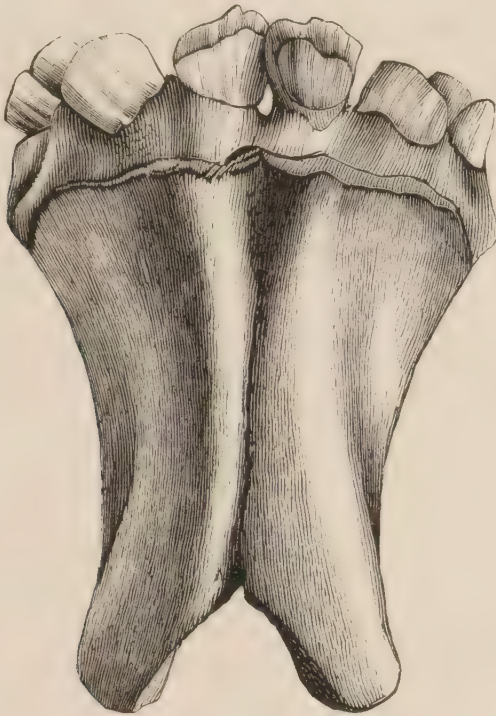


FIG. V.

dentine covered with cement, but without any enamel, at all events except at the extreme tip, from which it is soon worn off, the teeth of the Orcas are, on the contrary, provided with a complete covering of enamel to their free portion. Thus it is, properly speaking, only a very small piece, soon worn off, that deserves the name of

crown in the part of the cachalot's tooth standing out of the gum, and all the rest of it may be called a projecting part of the fang; but such is not the case with the teeth of the Orcas. In these a constricted part, the neck, encompassed by the gum, may be perceived between the crown and the fang, at least in the teeth of young individuals; the crown is gradually worn off as the animal gets older, but the fang, though in the full-grown tooth at least one and a half times longer than the crown, never grows out to repair the loss, which may be supposed to take place in the cachalots, as we know from our own observation that it takes place in the beluga, even to an extraordinary degree. The earliest form of the teeth of the Orca is that of a single cone almost an inch and a half high, half an inch to one inch broad. They are not only open teeth, but filled with pulp to such a degree that their solid walls, though consisting of two layers of different kinds—in the crown of dentine and enamel, in the root of dentine and cement—have scarcely anywhere a thickness of more than half a line, not even at the very top of the crown, while the diameter of the hollow of the pulp is about an inch. Like teeth in general, they present, at a very early period, when removed from their natural places, a certain resemblance to small caps of paper, and are of course extremely brittle.

In the teeth of the cachalots the formation of the dentine proceeds so very fast that even when quite small they have already very thick walls, presenting only a very small cavity for the pulp, at the point of the root, in the shape of a very low cone. But the contrary is the case with the Orcas; their teeth are characterised by a surprisingly slow ossification, a circumstance which often produces in them a peculiar morbid condition, excited by friction. The conical teeth in the upper and lower jaws are very regularly fitted in between each other, so that in general they are not easily exposed to any friction at these points—at least, not at the beginning. But having such a considerable breadth, and being placed close to one another, the inevitable consequence is that they become worn on the lateral surfaces. Even in very young teeth we find an elongated concave friction mark on one of the sides: in the upper jaw most commonly on the anterior and external sides of the teeth, but on the lower jaw in the posterior and internal sides. The more excavated this worn surface becomes, the deeper of course the teeth of the two jaws will be wedged in between each other. Soon most of the teeth are worn by both of the opposite ones. The worn surfaces meet each other at the point, which is completely worn off, and the original conical teeth, with their decidedly pointed, if not very sharp

ends, are now changed into flat and obtuse teeth. As in all other real—that is to say, enamelled—crowns of teeth, the portion once worn off is not compensated for by a growing out of the root of the tooth, and in old specimens all the crowns of the teeth may be found worn down to the very gums. This wearing off does not generally take place until the formation of the dentine in the crowns has been completed, or until the crowns of the teeth are perfectly ossified. But it not unfrequently happens otherwise, and then the wear penetrates both the enamel and the still thin layer of dentine, so that the pulp is exposed and dies away, and the formation of the dentine is not only stopped in the crown, but also in the root, which is never closed, and the whole tooth remains hollow from the worn surface down to the point of the root. Nevertheless, such decayed teeth do not fall out.

In 1873 Mr. Chas. Tomes (17) reported a case of this nature to the Odontological Society. The specimen in question was a grampus (*Orca gladiator*), now in the Oxford University Museum. Mr. Tomes gives rather a different explanation to that advanced by Eschricht. In the Oxford specimen, Mr. Tomes supposes that the regular interdigitation of the upper and lower teeth had by some cause been interfered with, so that all the teeth on the right side of the mouth met

point to point. As a result of this, the wear on their apices was greatly increased—so greatly that the wearing down of the crown has exposed the pulp cavity before it could become obliterated by progressive calcification.

From an examination of the skeleton, Mr. Tomes was unable to discover the cause of this disturbance in the relation of the teeth, and the displacement was so slight that it could not be distinctly made out when the skeleton was cleaned. It must be admitted that this explanation is not quite so satisfactory as that of Eschricht, whose acquaintance with whales was so intimate; but it is well to find that the two observers agree in the main point, viz., that the disease was due to exposure of the pulp cavity before the pulp had time to calcify, the wear being in excess of the formative power of the pulp.

The Middlesex Hospital Museum has a specimen of this nature, showing in a curious way all stages of this condition. In some of the anterior teeth, the pulp cavity is almost obliterated by calcification. The middle ones are deeply worn by friction, whilst the posterior teeth have lost their crowns, and the pulp chamber is widely open.

Alveolar Abscess is very frequent in young animals; many cases have come under my notice, and its results are more disastrous than in human beings. Death the result of an alveolar abscess

is, I should imagine, a thing unheard of in man ; not so with animals. The first case which I examined was in a young chimpanzee ; on exposing the lungs some patches of pneumonia were observed, resembling in all respects those patches one is accustomed to see in patients dying from malignant disease of the tongue or pharynx, due to the inspiration of morbid material. On examining the mouth, an abscess cavity was found connected with a carious tooth and a necrosed portion of the jaw. The course of events must have been this :—Pus collected giving rise to an abscess ; this burst by a sinuous or narrow opening ; during sleep the discharges would collect in the animal's mouth, and be drawn into the trachea during inspiration, thus giving rise to septic pneumonia. To show that this explanation has a sound basis, it will be well to mention that this cause of death has been traced in several deer, particularly in a long-standing case which occurred in a specimen of Swinhoe's water deer (*Hydropotes inermis*). The condition of the maxillæ in this animal is shown in fig. VI ; other examples were met with in a chimpanzee, a common rhesus monkey, and my last example was from a rattel. This mode of death happened to a very fine specimen of kangaroo. In this instance the abscess was caused by necrosis of the hyoid bone, and the sinus leading to the abscess cavity opened in the glosso-epiglottidean folds.



FIG. VI.

Septic pneumonia was set up by pus dribbling into the larynx, that fact being well established at the autopsy by finding pus in the trachea and bronchi, even to some of the consolidated patches.

In this series of dental diseases it is desirable to place on record a case in illustration of the dangers incurred in attempting to palliate the sufferings of some of the brute creation.

It concerns the now famous African elephant, Jumbo. It is well known that this animal possessed only two stunted remains of tusks, and that they projected through the skin of the cheek. Some years ago, in a fit of passion, the elephant broke the tusks short off within their alveoli; the opening in the tissue closed, concealing the stumps from view. As time rolled on, it became obvious that an abscess had formed in the neighbourhood of the stumps. This increased in size, the elephant became thin, and was evidently in great pain, refusing food. It was clear to all concerned that unless the abscess burst or was opened, the elephant must die. Mr. Bartlett determined to make an attempt to puncture the abscess. He made a lance and fitted a handle to it, then mounted the gallery in the elephant's house, and tempting it with dainties, made a thrust with the spear, but, unfortunately, only succeeded in cutting three parts through the animal's hide, and of course failed to open the abscess. All attempts to entice

Jumbo again to the gallery were unavailing. Still the animal grew gradually worse ; something must be done. Mr. Bartlett now determined to meet the brute on level ground. He had an instrument constructed of iron, 3 feet in length, one end of which was curved something like a crook, the other end had a rope attached. With this instrument concealed in his sleeve Mr. Bartlett and the keeper approached the elephant, and whilst stroking his cheek, adroitly slipped the curved end of the lance into the hole in the cheek made at the previous attack, then suddenly hanging on to the end of the instrument opened the abscess, and they were instantly in the midst of a perfect deluge of pus and blood. The elephant turned tail, much to their relief ; they were well aware that he would do one of two things : either retreat, or *kill* them. The elephant, sensible of the relief he had obtained, allowed the abscess cavity to be washed out, and when an abscess formed on the opposite cheek, allowed that to be *opened* without resistance. Through the apertures thus formed his tusks appeared : this explains why they pierced his cheeks instead of appearing from under the lips, as is usual.

It would be very difficult to find a more noble example of true bravery than this. Mr. Bartlett knew full well the danger he ran. Yet the sense of duty, and the wish to relieve the suffering animal, stimulated him to risk his life to give ease to and save the life of Jumbo.

Odontomes.—Numerous examples of odontomes, or tooth tumours, have been recorded in animals. E. M. Rousseaux, Goubaux, and Charles Tomes (18) have found them connected with the teeth of horses. Mr. Tomes's case is interesting inasmuch as the tumour took up a position with the other teeth, and for a time performed the function of a tooth, for it was worn by mastication. The specimen is now in the Museum of the Odontological Society.

Magitot mentions an odontome connected with the molar tooth of a horse, of which he received a photograph. The tumour was a voluminous one, and weighed one thousand grammes.

The same author gives figures of some excellent examples of tooth tumours occurring in horses, hippopotami, elephants, a wild boar, and in oxen. The most beautiful of all is one developed from the tusk of a young white elephant of Siam.

The case belonged to Professor Lorain. The tusk was normally formed of ivory and cement, and presented on one side, about its middle, an enormous ovoid tuberculated mass, measuring 20 centimètres in length and 9 centimètres across. It was attached to the tusk by a narrow pedicle. In the drawing (fig. VII) it is represented one-third its natural size. The Odontological Society possesses a very large tumour of this nature, also from the tusk of an elephant.

Perhaps the large masses of osteo-dentine found



FIG. VII.

in elephants' tusks surrounding foreign bodies ought to be included in this part of my paper, but they are so interesting and instructive that a chapter has been devoted for their especial consideration. A very fine example of osteo-dentine exhibited in the Museum of the College of Surgeons is described here, because there is no evidence of its being deposited around a foreign body.

Fig. VIII is a drawing of the abnormal mass which is described in the catalogue as "a portion of the basal part of the tusk of an elephant with a large irregular stalactic mass of osteo-dentine growing into the pulp cavity."

CHAPTER V.

FRACTURE OF TEETH.

WHEN we remember that animals not merely use their teeth for masticatory purposes, but also for procuring or retaining their food, it is not surprising that fractures of teeth should occasionally occur.

It is well known to anatomists that in viperine snakes provision is especially made to protect these reptiles from the dire effect of the loss of its fangs by fracture, so liable to take place when these snakes strike their prey. When not in use it is carefully stowed away inside the mouth, and a



FIG. VIII.

second smaller tooth in each premaxillary bone is always kept in reserve in case of accident.

Dr. Murie has noted two cases of fracture of

teeth—one in a bear, a broken canine, the other in a hippopotamus; the details of the extraction of the injured tooth from the mouth of this ponderous brute are extremely interesting and exciting.

Dr. Walker recorded the case of a monkey kept as a pet, but the owner, fearing the creature would bite his children, broke off the canine teeth. As a result of this treatment, the pulp of one inflamed, and at the animal's death hypertrophy of the bones of the face of the affected side had taken place to a considerable extent, probably due to nervous irritation set up by the exposed pulp.

The teeth of adult carnivorous animals kept in captivity are frequently broken, especially the canines, brought about by the creatures biting the iron bars of their cages, and gnawing the hard, compact tissue of bones.

Among the most interesting of this class of cases must be included the hippopotamus tooth described and figured by Owen in his "Odontography." It was an inferior canine tusk, which showed clearly that, by some injury or other, it had been snapped across the implanted and hollow base with probably injury to the socket; but the broken portions adhered together, and to the surrounding parts, inflammation of the pulp and capsule had ensued, osteo-dentine formed, and the two fragments united—the pulp cavity being obliterated at the seat of union. The remains of

the pulp cavity in the crown were unusually conspicuous in the form of a narrow channel near the concave side of the tusk, and opening like a fistula upon that surface ; just beyond the fracture another irregular slender canal extended transversely through part of the uniting substance, and opened on the concave side of the tusk, just below the preceding.

Mention must be made of the case described and figured by Mr. John Tomes (27), in his "System of Dental Surgery," of a fractured tusk of a hippopotamus which had become united. The specimen clearly shows that union may take place after a severely comminuted fracture, with considerable displacement of the fractured part. Mr. Tomes also points out that the union is effected by cementum. For such union to take place the tooth must be broken within the socket, but whether the repair takes place from cementum alone, or from deposition of tissue from the pulp cavity, does not seem at all clear and decisive.

CHAPTER VI.

PARASITES.

ON February 21st, 1871, Mr. Sclater (19) exhibited before the Zoological Society of London a pair of tusks of a female Indian elephant (*Elephas*

indicus), which presented the appearance of having been corroded or eaten away in the basal portion immediately adjacent to where they entered the gums. Just below this, on the outer side of each tusk, was deposited a mass of egg-like bodies, arranged in regular series, apparently of some dipterous insect, and somewhat resembling those of the common blowfly (*Musca vomitoria*). These tusks had been sent from India by Mr. G. S. Roden, of the 1st Royals, who gave the following account of them:—

“The tusks belonged to a female elephant, shot last June at a place called ‘Muddry,’ at the foot of the Manantowady Mountains, in Malabar.

“Directly after shooting her I lifted up her lips to see the size of her tusks, and then noticed the deposit of eggs on them. I had them carefully cut out. On cleaning the tusks afterwards I noticed that they had been eaten away at the ends, and also near where the white eggs were. *There were no maggots* in the grooves at the end of the tusks; they were merely filled up with some dark dry clay. The tusks have been slightly polished over, but I took great care that the eggs should not be touched.”

Mr. Sclater then drew attention to a letter in the *Field* newspaper of March 12th, 1870, in which the following statement appeared, signed by a well-known Indian sportsman, under the pseudonym of “Smoothbore”:—

“Has any zoologist or microscopist ever noticed how the tusks of female elephants are attacked and eaten away by some parasite? And is it not most singular that this has never been observed in the tusks of the male?”

Professor Flower has also drawn attention to an exactly similar pair of tusks in the Museum of the College of Surgeons. Mr. Charles Tomes mentions a statement of Major Rossall, to the effect that the tusks of all the female elephants that sportsman had seen were so affected, and that the larvæ or pupæ of a dipterous insect are found embedded in the gum and attached to the surface of the tusk. Mr. Tomes suggests it would be of interest to ascertain whether the larva really eats away the tusk or whether the wasting of the tusk be due to absorption set up by the irritated gum.

The case next to be related is of considerable value, on account of its bearing on this erosion of the tusks of a female Indian elephant said to be due to the pupæ of a dipterous insect. The history of the case, as reported in the “Proceedings of the Zoological Society” for 1875, by the late Mr. A. H. Garrod, runs thus:—

The elephant, a female, was born in India (probably in the spring of 1850). The mother and calf were purchased by the Zoological Society in 1851. The young one lived until July 7th, 1875, being therefore twenty-five years old. The Super-

intendent, the head keeper, and the elephant keepers are of opinion that it continued to grow until within a year of its death. Its height at the withers, at the time of its death, was just 8 feet.

For the last four years the animal had lost the power of extending its trunk, from paralysis of the anterior intrinsic muscles of that organ. It has thus not been able to throw its trunk over its head, or even the least forwards; when it took food it flexed the trunk so as to present the orifice forwards. This symptom is one of decay.

For the last two years of its life it exhibited marked signs of rheumatism, varying in severity, but very considerable at times. This was most manifest on its kneeling down to be saddled.

For about six months the animal did not, as it was formerly wont to do, lie down at night. On the night of the 6th of July it fell on its left side and did not subsequently make any attempt to rise. It died during the night of the 7th, having, at 8.30 p.m., had a large dose of strychnia given it by the mouth. Whether the poison was the cause of death is uncertain. Over 100 grains were administered. It may be mentioned that the teeth just coming into wear had, in both jaws 23, 24, or 25 plates; they were therefore the sixth molars. The epiphyses of the long bones were firmly united. No entozoa were found. The lungs were infiltrated with tubercular deposit.

The history has been reported at full length on account of the important bearing it has upon the condition of the tusk. After death the creature decomposed so rapidly that careful dissection was impossible. The following facts came to light during the disposal of the carcass, and I state them on the authority of Mr. E. Ockenden, the excellent assistant in the Prosector's Room at the Gardens. During the animal's life no tusks were visible, but on looking into the mouth after death, a projection was noticed on the mucous membrane just where a tusk ought to be. More careful search revealed the end of a tusk projecting 1 inch above the alveolus, and on chipping away the bone a rudimentary tusk was exposed (fig. IX). There was no corresponding tusk on the opposite, although very carefully sought for.

The tusk measures 13 inches in length, and is 4 inches at its greatest circumference. The exerted portion measures exactly 1 inch. The succeeding 3 inches of the tusk are extensively eroded on one side only, so that in places just one-half of the thickness of the structure has been removed. The nature of the erosion resembles in every respect that which, in the case of the tusks previously referred to, is said to be due to the larvæ of a dipterous insect.

The importance of this observation is obvious, for the erosion in this instance clearly cannot be

due to the larvæ in question, for in this case the morbid action occurred in the tusk deeply seated



FIG. IX.

in the alveolus at a spot certainly inaccessible to a dipterous insect.

With these facts in view, I think it fairly obvious that this form of erosion is due to absorp-

tion, and that the presence of the larvæ cannot be regarded as having anything to do in the matter. In the other reported cases the tusks came direct from India, this being, I believe, the first case recorded in an elephant which left its native country at so tender an age.

The only explanation I can offer on the matter is this one:—Pathologists have long been aware that morbid changes are more prone to attack undeveloped, functionless, or imperfectly acting organs; hence I imagine that the tusks of female elephants are more prone to inflammation than the full developed representatives in the male.

CHAPTER VII.

FOREIGN BODIES IN TEETH.

PROFESSOR Owen points out that the incisive teeth or tusks of the elephant not only surpass other teeth in size, as belonging to a quadruped so enormous, but they are the largest of all teeth in proportion to the size of the body, representing in a natural state those monstrous incisors of the rodents which are the results of accidental suppression of the wearing force of the opposite teeth.

In male Indian elephants they have been known to acquire a length of 9 feet, with a basal diameter of 8 inches, and to weigh 150

pounds. These extreme dimensions are rare in the Asiatic species. With these facts in view, and remembering the various modes in which these animals are hunted, both by civilised and savage races of mankind, and the different missiles used in the warfare, it is not surprising that now and then foreign bodies should be found in some part or other of these enormous teeth.

It is no uncommon thing to find musket balls, bullets, spear-heads, and other foreign bodies impacted in the ivory, the intruding substance being surrounded by osteo-dentine, and this in many cases without obvious breach of surface. It used to be a subject of wonder how such bodies found their way into the solid portions of the tusk without flattening of the bullet or cicatrix marking the point of ingress. The history of our knowledge on this subject is very instructive, for it serves to illustrate the way in which facts merely recorded for their curiosity later assume considerable scientific importance.

Haller refers to the circumstance of foreign bodies in teeth in his "*Elementa Physiologiæ*" (20).

Klockner mentions a gold ball which was found by a turner of Amsterdam in the substance of an elephant's tusk. Camper (24) mentions the case of a bullet impacted in a tusk, and remarks that it is not unusual to meet with these foreign bodies in ivory. Cuvier (23), in 1808, noticed the presence

in the tusks of elephants of foreign bodies, and that the ivory outside the ball was natural, but that immediately surrounding it was irregular. He supposed the ball to penetrate the very thin bases of the tusks in young elephants, so as to enter the pulp when in a growing state, as the following passage clearly shows :—

“C’est que la balle avoit traversé l’alvéole et la base encore mince de la défense d’un jeune éléphant, et s’étoit logée dans le noyau pulpeux, encore dans tout son développement.”

Blumenbach had a tusk of this nature in his collection, which showed traces of a cicatrix closing the entrance made by the foreign body, and deduced therefrom a property in the elephant’s tusk to pour out bony matter in order to heal such wounds.

Cuvier clearly pointed out that the substance surrounding these impacted bodies differed from true ivory, and this was the keynote to the explanation of the mystery. The nature of this osteo-dentine was fully investigated by other observers ; particularly Owen and Mr. Alexander Nasmyth pointed out the resemblance of this substance to that which fills the pulp cavity of the human tooth under certain conditions. In 1841, Mr. Goodsir (22) published a very interesting and comprehensive memoir on the subject, in the “Edinburgh Philosophical Transactions.” He divides injuries of the tusk into three classes :—

- 1st. When the ball hits the free portion of the tusk, if it only penetrates to a certain depth of the ivory, no change takes place.
- 2nd. Those cases in which the ball enters the pulp cavity through the socket and side of the tusk. The ultimate changes being, in favourable cases, the formation of osteodentine, the enclosure of the offending body, and obliteration of the breach in the side of the tusk. Gradually the tooth advances in the socket, and eventually the foreign body arrives at a sound portion of the tusk.
- 3rd. When a foreign body enters from above through the open end of the pulp chamber without wounding the tusk.

The entrance of a bullet is readily understood ; the great force by which these deadly missiles are propelled easily carries them through most animal structures, but not so with regard to spear-heads, the occurrence of which in the middle of tusks is beyond question. But Mr. Charles Tomes (25) gives a very intelligible explanation of an instance of impacted spear-head, as follows :—

“It is to be presumed that a heavily loaded spear was dropped by a native from a tree, with the intention of its entering the brain, upon the elephant as it was going to water. But in these

cases the spear penetrated the open base of the growing tusk, which looks almost vertically upwards (fig. X), and then the iron point appears to have broken off: this did not destroy the pulp, but the tooth continued to grow, and the iron point, measuring no less than $7\frac{1}{2}$ by $1\frac{1}{2}$ inches, became so completely enclosed that there was nothing upon the exterior of the tusk to indicate its presence."

The Museum of the Royal College of Surgeons contains several excellent examples of foreign bodies enclosed in elephants' tusks, and the Museum of the Odontological Society has also some good specimens of this condition—among them an example of a bullet in the molar of an elephant.

SUMMARY.

IN the preceding pages an attempt has been made to collect and classify our knowledge of the "diseases of teeth" in all kind of animals. Comparative Pathology has been little studied in this or any other country. A systematic attempt to bring about a knowledge of the "Diseases of wild Animals" has never been made until recently. Isolated cases have been reported here and there, when the specimens seemed more than usually curious, as in the case of foreign bodies in

elephants' tusks. Yet the mode by which these substances became enclosed is an exemplification, on a grand scale, of the mode by which caries is prevented in many cases from attacking the pulp in human teeth, viz., by the formation of secondary dentine, first pointed out, I believe, by Mr. Alex-

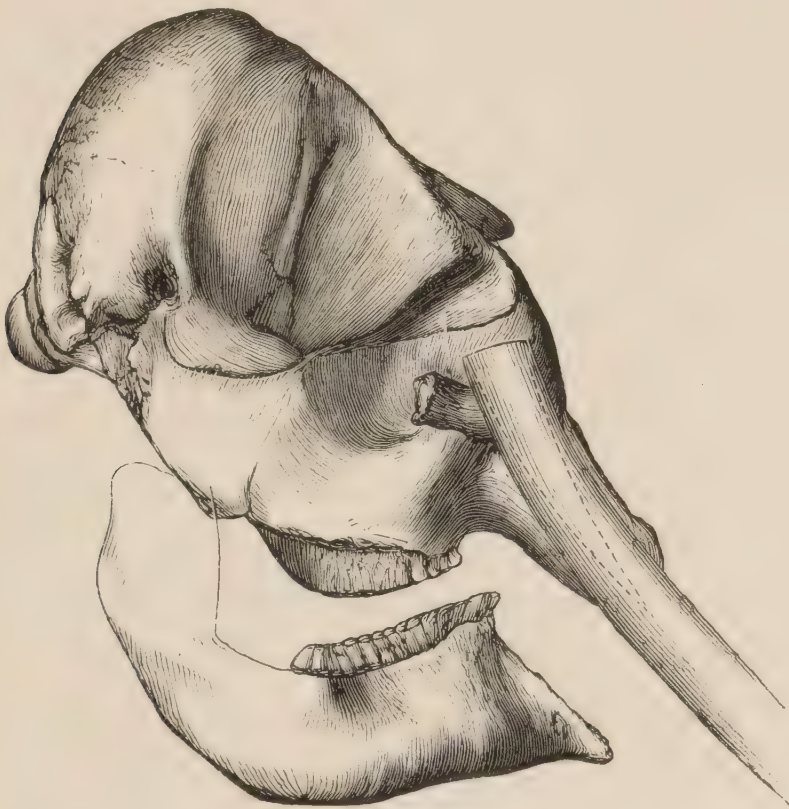


FIG. X.

ander Nasmyth. Also with regard to the slight mobility of the elephant's tusks, and the aberrant canines of the babirusa, allowing these teeth to take a false direction, is only an instance of the principle on which the surgeon-dentist acts in treating regulation cases.

As far as I can gather from my reading, the possibility of a tooth fractured in its socket, uniting, was put on a much surer footing by the discovery of two examples of hippopotamus teeth, in which this event had taken place beyond all cavil.

But it is with regard to caries that the true value of systematic observation stands out prominently. Every writer on dentistry points out that caries is very rarely met with in animals, and as far as my observations go this opinion is fairly correct, but it is founded on no very sure basis. No one, so far as I can learn, after diligent search, has investigated the matter with the care it deserves. Museums of Natural History are the wrong places to look for diseased teeth. I have examined hundreds of animals' skulls of this kind. Imperfection of the teeth would alone be quite sufficient, in ordinary specimens, to exclude the skull from a position on the shelves. This is well shown in Professor Flower's paper (4), who, in that large and magnificent collection of vertebrate skeletons at the College of Surgeons, found only about six examples of abnormal dentition. In the course of my investigations at the Zoological Gardens I have examined hundreds of animals of all kinds; the number of cases of caries has been very limited, so that for once systematic observation has, contrary to the general rule, substantiated a "general opinion" that caries rarely attacks the

teeth of wild animals, even in the state of captivity. The whole question set forth in this paper is one that will repay careful inquiry at the hands of those who have the opportunity of investigating the question; though affections of the teeth do not, as a rule, involve issues of life and death, directly, yet they tend to make the possessors of diseased teeth, at times, some of the most miserable of mankind.

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EXPLANATION OF FIGS.

- FIG. I.—The palate of a marmot, showing two teeth growing from the palate on the inner side of the alveolar arch.
- „ II.—Lower jaw of a Corean pig. The tusk has grown at the fang so as to form a tumour on the outer surface of the maxilla.
- „ III.—The mouth and incisor teeth of a coypu rat. The right upper and left lower incisor having been broken, the two remaining teeth have grown long and opposed one another.
- „ IV.—Teeth of the seal (*Otaria jubata*), showing erosion (after Murie).
- „ V.—Anterior portion of the lower jaw of a horse, showing erosion of the central incisors (after Magitot).
- „ VI.—Lower jaw of a deer (*Hydropotes*), showing the effects of alveolar abscess.
- „ VII.—Odontome growing on an elephant's tusk (after Magitot).
- „ VIII.—A large mass of osteo-dentine occupying the pulp cavity of an elephant's tusk. (College of Surgeons' Museum.)
- „ IX.—The tusk of a female Indian elephant, age twenty-five years, affected with erosion. One-third its natural size.
- (a) Exserted portion of tusk.
- (b) The eroded portion.
- „ X.—Skull of an elephant to show the mode in which spear-heads may gain an access to the pulp cavity of a tusk.

The PRESIDENT said that before members proceeded to discuss the very interesting paper they had just heard, he would take the opportunity of announcing that, according to the report of the Scrutineers, the following gentlemen had been elected to form the Executive and Council of the Society during the year 1884:—

PRESIDENT.

Jas. Smith Turner, Esq.

VICE-PRESIDENTS.

Resident, Henry Moon, T. Charters White, and George Gregson.

Non-resident, Messrs. Wm. Doherty (Dublin), J. T. Browne-Mason (Exeter), and Richard White (Norwich).

TREASURER.

James Parkinson, Esq.

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EDITOR OF THE TRANSACTIONS.

Henry Sewill, Esq.

HONORARY SECRETARIES.

Messrs. J. H. Mummery (*Council*), David Hepburn (*Society*), and R. H. Woodhouse (*Foreign Correspondence*).

COUNCILLORS.

Resident, Messrs. G. A. Ibbetson, Ashley Gibbings, Thos. A. Rogers, F. Canton, Alex. Cartwright, Chas. S. Tomes, W. St. George Elliott, Augustus Winterbottom, and Storer Bennett.

Non-resident, Messrs. R. Rogers (Cheltenham), W. Hele (Carlisle), A. Wilson (Edinburgh), J. Fenn Cole (Ipswich), George M'Adam (Hereford), and W. E. Harding (Shrewsbury).

DISCUSSION.

MR. A. COLEMAN said the paper was certainly a very valuable contribution towards the study of a subject which, as Mr. Sutton had correctly stated, had not yet received the attention which its great interest and importance demanded. He had himself been greatly interested in Mr. Sutton's remarks on the peculiar form of erosion occasionally met with on elephant's tusks, since this was a matter to which he had given some amount of attention when preparing the paper on Erosion, which he had read before the Dental Section of the International Medical Congress in 1881. It was remarkable in the first place that this appearance was only found on the tusks of the female elephant, and only in those of Ceylon. The conclusion he had come to, after a careful examination of the tusks, &c., was that the changes were the result of irregular absorption, probably due to irritation of the mucous membrane about the neck of the tusk, but whether this had been set up by the presence of the parasites, or whether these had been attracted by the existence of some unhealthy secretion, or whether the presence of the pupæ was altogether accidental, he had not been able to decide. He had understood Mr. Sutton to say that the tusk exhibited had not been erupted, but on inspection he found that the point showed evident signs of having been used. He thought, therefore, that it must certainly have been erupted, but probably the point had been again covered up or concealed by a hypertrophied condition of the surrounding mucous membrane.

Mr. Sutton had spoken of the greater development of the teeth in the case of over-fed animals; this might be true, though contrary to what was the case in the human species, but he (Mr. Coleman) thought it would be found that the teeth in such cases would also be liable to premature degeneration. The evidence we possessed at present certainly went to prove that luxurious feeding had this effect.

MR. F. J. BENNETT said he had always been much struck

with the remarkable regularity generally seen in the teeth of rodents and other animals having teeth with persistent pulps. Of course exceptions were occasionally met with, but considering the liability to accident, and the slight causes which, as Mr. Sutton had pointed out, sufficed to alter the direction of the teeth, he thought the general regularity of the dentition and the comparative rarity of the exceptions very remarkable.

With reference to what Mr. Sutton had stated regarding the effects of alveolar abscess in animals, he found it difficult to believe that pus could run into the trachea in such quantity as to set up septic pneumonia. The entrance of a very small quantity into the larynx would immediately cause spasmodic contraction of the glottis and violent reflex disturbance. He thought, therefore, that the pneumonia must be ascribed to some other cause.

MR. STORER BENNETT said he had heard it stated that young lions born in captivity were very liable to have cleft palate, and that this had been the case at the London Zoological Gardens. He should be glad if Mr. Sutton would inform him if there was any truth in this statement.

MR. S. J. HUTCHINSON remarked, with reference to Mr. Sutton's statement that death from alveolar abscess was probably unknown in the human subject, that two fatal cases of this affection had been published within the last six months.

Mr. Sutton had called attention, in the case of the ricketty lion, to the size of the teeth and the thickness of the enveloping membrane. But as the teeth and the membrane were developed from the same foetal layer, it appeared to him (Mr. Hutchinson) only natural that when the teeth were large the membrane would also be strong.

MR. PEDLEY said, in reply to Mr. Storer Bennett, that it was a fact that young lions born in captivity were liable to have cleft palates, but only in cases where the parents had not been allowed a proper diet; where this was attended to the deformity did not occur.

With regard to the liability to septic infection from alveolar abscess, he would call attention to the case of a medical practitioner, mentioned in Playfair's "Midwifery," whose patients were constantly suffering from puerperal fever; various precautions were adopted without success, until it was noticed that his mouth was in a very bad state, some necrosed stumps having given rise to chronic suppuration, &c. This having been remedied, the liability to communicate puerperal septicæmia at once ceased.

MR. DAVID HEPBURN said he had noticed that in the case of unerupted teeth in the human subject, absorption did not occur unless there was some communication with the surface by means of a fistulous opening. He had met with cases in which teeth which were perfectly enclosed had remained sound through a long course of years; but in two cases where a fistulous opening had existed, the teeth when removed bore traces of absorption. He thought, therefore, that in the case of erosion of the tusk of the female elephant, either the tusk must have been erupted and covered over again, as Mr. Coleman had suggested, or that a sinus had existed leading down to the diseased part.

MR. OAKLEY COLES said it was a fact that some years ago several of the young lions born in the Zoological Society's Gardens were found to have cleft palates. General attention was called to this by a report written by Dr. Ogle seven years ago, and the advice of Dr. Haughton having been sought, he ascribed it to a deficiency of lime in the diet of the parent animal. His recommendations as to feeding were at once attended to, and since then no more cases of cleft palate had occurred.

MR. SUTTON having been called upon by the President to reply, said that with regard to the tusk of the female elephant which he had exhibited, and which Mr. Coleman thought had seen service, he could only repeat what he had already stated, viz., that although the animal had been in the Gardens for twenty-five years, no one knew of the existence of this tusk during its life. Even after death, although Mr. Garrod had

carefully examined the mouth, and had counted the plates of the molars, he had not observed it. The assistant who discovered it stated positively that the point could only just be felt above the level of the mucous membrane. Mr. F. J. Bennett had expressed doubts as to the possibility of pus running into the larynx; but there was the fact that in some of these cases the matter had actually been found in the trachea and bronchi. Moreover, it was known that the same thing might occur in the human subject, and when it was remembered that coins and other foreign bodies of considerable size occasionally passed through the glottis, it did not appear very surprising that pus might get into the trachea in the same way. With regard to Mr. Storer Bennett's query as to the frequency of cleft palate in young lions born in captivity, he could only say that no such case had occurred during the three years he had been dissecting at the Zoological Gardens. In reply to Mr. Hepburn's remarks he would refer him to a preparation in the Museum of the Middlesex Hospital. It was a dermoid cyst of the ovary containing teeth, and *one of these was carious*, though it was contained in a closed cavity, and had never been exposed to the air. He was very pleased to find that the subject appeared to interest the members of the Society, and hoped that before long it might be more systematically investigated.

The PRESIDENT then proceeded to deliver the following Valedictory Address.

PRESIDENT'S ADDRESS.

GENTLEMEN,

AT our last anniversary, January 1883, you conferred upon me the highest position you have the power to bestow on a private member of your Society—the Presidentship of the Odontological Society of Great Britain.

This appointment carries with it the respect and esteem of a large majority of fellow-workers in Dental Surgery; it means even more than this—that your President is considered capable of upholding the dignity of the Society, and is one who would maintain the efficiency of the work of the Session for which he is elected,—that the Society should be represented in all circles of the medical world by one who would carry with him the confidence of dental surgeons into the outer world, outside the walls of our own Society's domains.

What this responsibility really is, no one can estimate before he has passed the ordeal. If I could have foreseen the weight and degree of that responsibility, I should have left for a more capable head and shoulders the Presidency of '83.

I thank every member most sincerely for granting me such confidence, and for the continual support given me on all occasions in the conduct of our meetings: the Executive, for the help and assistance in all the details of the official work; the Treasurer, the Secretaries, the Librarian, the Editor, and every member of Council; our respected friend Dr. Langmore, for the correct reporting of the discussions and general remarks made at each monthly meeting; and last, but not the least important, our Vice-Presidents, whose voices have been frequently heard in Council when a more knotty

point of discussion has engaged the attention of the whole Executive.

For a few moments I will refer to the result of the Session of 1883-4.

The attendance of Councillors at the Council Board and the attendance of members at the General Meetings have been good, both in respect to numbers and intelligence; this fact must be patent to those who have kindly helped me in making the Session a prosperous one.

Our absent friends will rejoice in knowing that as many as seventy to eighty members have listened to and taken part in the discussion of Casual Communications and of the papers read.

Of the literary character of the papers the "Transactions" will give a faithful record, and prove that the volume of 1883-4 will be looked upon as a book of reference, and one well deserving special notice in dental literature.

Attention has been drawn by the work of the Session to the rapid disintegration of the dental organs. At the ages of two, three, and four the temporary molar teeth are carious, and frequently the enamel of the central teeth is eroded; this condition is nearly universal.

This fact has been impressed upon the minds of many of our most esteemed medical and surgical friends; the care of the oral cavity must be primary, imperfect mastication leading to scrofula, rickets, indigestion, ophthalmia, rheumatism, consumption, and even fistula,—pulverization and salivation of food to healthy development.

This condition must be sought by the physician, surgeon, and general practitioner, and, if proved, the dental surgeon must be the frequent consultant of the physician and surgeon.

The position the Odontological Society will take in the future will greatly depend on the degree of support it receives from the newly qualified L.D.S. men from our various

colleges. If they elect to become members and throw interest into the work of the Society, it must become the centre of intellectual life—the more highly cultivated the dental surgeon, the greater his intellectual power; hence the growth of the Odontological Society.

My anxiety for the future success of the Society was shown in my Presidential Address by my proposal of a few innovations.

Perhaps my colleague, James Smith Turner, may see his way clear to introduce some new life, so that we may run on equal lines in London to those that provincial dental practitioners enjoy at the meetings of our sister Association, the British Dental Association.

At the June meeting of this year we continued the usual routine of former years, the Council deciding that the old arrangement was the most fitting for our scientific character; the President is but one, and can only suggest: the wisdom rests with the Council, and the decision of that body is final.

I also proposed prizes for our dental schools, and that the Society, through its President and members, should be interested in dental education so far as to become the link between the students and the prize-man and the schools. This proposal was considered by the Council as one involving my successors in too heavy a responsibility, and one quite outside the bounds of our Association.

I can only fall back on the old routine of requesting some private member of our profession to assist me in giving that stimulus to the dental schools which I proposed should come through the hands of your various Presidents.

I still hold that there are more reasons in favour of my scheme than against it; I will even intrude my opinion one step in advance, and express my fears that if some such innovations are not adopted by your Council, our prosperity will recede, while other Institutions with new life will advance.

The Laws and Bye-laws of our Society have been proved

to be sound and practical. Members desiring to take part in the councils of the Society have only to show their interest in its well-being by constant attendance at the meetings, by careful preparation of the subjects brought under consideration, so that they can take a distinguished position in the discussions, and by offering papers to be read at the usual monthly meetings,—such men must and will be easily recognised and only be too well received by the active members of our body. Intellectual activity, patient and untiring daily effort in bringing sound facts matured to the notice of the Society, is the true means of helping forward to useful ends the main object of our Association, and the best cure for any little feeling of anxiety for the mutual government of our Society.

These are only a few words of farewell; I have obtained for you to-night a much more fitting entertainment at the close of my presidency in the reading of an excellent and carefully prepared paper, the result of extensive study, preparation, dissection, and original investigation.

I thank Mr. Sutton and all our friends for their kind productions throughout the Session.

In retiring from the chair to give place to our new President, elected to-night by your universal suffrage, I do most cordially congratulate you on his election, and James Smith Turner on the honour you have conferred upon him.

He is a man of strong resolve, great intellectual power, and indomitable perseverance; he will maintain the Society in the full tide of its prosperity during his year of office.

GENTLEMEN, I again thank you for your polite attention and consideration for the many deficiencies, personal and very apparent, during my presidency.

VOTES OF THANKS.

MR. W. WOODHOUSE said he felt sure he need not waste many words in asking the members to pass a hearty vote of thanks to the retiring President for the able manner in which he had conducted the proceedings of the Society during his year of office. He had been most punctual and exact in the discharge of his official duties, both at the Council and at the ordinary meetings, and most zealous in maintaining the honour of the Society elsewhere.

The resolution having been carried with acclamation,

MR. VANDERPANT proposed a vote of thanks to the Secretaries, Treasurer, and other officers of the Society.

MR. PARKINSON briefly responded, saying that the Secretaries in particular thoroughly deserved the thanks of the Society, since, as few knew better than himself, their office was by no means a sinecure.

The PRESIDENT thanked Mr. Woodhouse and the members for their resolution, and reminded them that the next meeting would take place on February 4th.

He then adjourned the meeting.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

February 4th, 1884.

J. SMITH TURNER, M.R.C.S. and L.D.S.Eng.,
PRESIDENT, IN THE CHAIR.

The Minutes of the previous meeting having been read and confirmed,

MR. H. C. QUINBY signed the Obligation Book, and was formally admitted to Membership by the President.

MR. JOHN MCKNO ACKLAND, L.D.S.Eng., of Exeter, was balloted for and unanimously elected a member of the Society.

MR. WEISS announced that the recently published volumes of "Transactions of the Royal Institution of Great Britain" and of the "Quarterly Journal of the Microscopical Society" had been presented to the Library.

MR. S. J. HUTCHINSON said he had received from Mr. Fenn Cole, of Ipswich, a model of a case of cleft palate. He was sorry he had not thought of suggesting at the last meeting that any models of cleft palate cases which might be sent to him would be greatly increased in value if accompanied by a reproduction of the plate which had been fitted for the relief of the deformity.

He also exhibited a model of the upper jaw of a lady, aged sixty, showing the right upper canine just erupted. The place of the missing canine had for many years been filled by an

artificial one attached to a plate, and he (Mr. Hutchinson) thought he had noticed in younger people that when the appearance of any of the permanent teeth was delayed, wearing a plate seemed to facilitate their eruption.

MR. F. CANTON related the following remarkable case of hæmorrhage after attempted extraction of a tooth:—

A police constable was sent to him by a divisional surgeon with a request that he would advise as to the best means of arresting the very free hæmorrhage from a tooth from which the man had been suffering for twenty-four hours. The patient's mouth was full of blood clot, on the removal of which Mr. Canton found that the bleeding came from a lower molar. The crown of the tooth had been broken off in an attempt at extraction, leaving the pulp exposed, and the hæmorrhage came from the pulp, which was exceedingly sensitive. Pressure being impossible, Mr. Canton recommended immediate extraction of the tooth, but the patient was unwilling to submit to this, and was besides very faint from pain and loss of blood. He was therefore given some ice to suck, and this after a short time arrested the bleeding. The tooth was extracted next day under gas at the Dental Hospital, and no unusual amount of hæmorrhage followed the operation. Mr. Canton added that he had never before met with a similar case, and would scarcely have thought it possible that such profuse and long-continued hæmorrhage could have arisen from such a source.

The PRESIDENT remarked that he had a patient then under his care for whom he wanted to fit a crown to the stump of a six-year-old molar, but whenever he attempted to clear out the anterior root such free hæmorrhage occurred that he was obliged to plug the canal and leave it. This had happened several times. He had advised the patient to have the tooth extracted, but he would not consent, so he (Mr. Turner) felt obliged to persevere a little longer in the hope that this trouble would eventually disappear; but he felt quite at a loss to account for such an unusual complication.

MR. GEO. PARKINSON showed 'a sequestrum removed from

the lower jaw of a boy nine years of age. The boy was brought to the Dental Hospital by his mother, who stated that one of his teeth had been extracted, rather roughly as she thought, at a General Hospital four months before; much pain and inflammation followed, and this had never subsided. An abscess was pointing externally. An incision was made over the swelling inside the cheek, when a quantity of matter escaped and bare necrosed bone could be felt. A large sequestrum, with the twelve-year-old molar attached, was then removed with forceps. The parts quickly healed, and the threatened external opening did not take place.

MR. WALTER COFFIN said he had a case under treatment which might be worth mentioning. The patient, an officer, was thrown from his horse, and received somewhat severe contusions of one side of the head and face. Soon afterwards signs of necrosis of the upper jaw began to show themselves, and although the actual extent of the necrosis could not yet be clearly made out, he (Mr. Coffin) feared that the whole of one side would be lost.

MR. F. J. BENNETT asked Mr. Parkinson whether any loss of sensation had followed the removal of the sequestrum in the case he had just mentioned. In a somewhat similar case which had come under his own observation he found that the lateral and canine were sensitive on the damaged side, but that all the teeth behind the canine were insensitive.

MR. W. E. HARDING, of Shrewsbury, said a case had lately occurred in his practice about which he should be glad to ascertain the opinion of the members. A gentleman had the crown of a lower wisdom tooth broken off in an attempt at extraction, and some further injury must have been done, since the operation was followed by much pain and local inflammation. A fortnight afterwards he came to Mr. Harding, who with some difficulty removed the roots. Then an abscess formed followed by constant discharge of pus, and at last a sequestrum was found and removed. It proved to be a large piece of the body and ramus, but there was no trace of the inferior dental canal to be seen on it. Notwithstanding, loss

of sensation in the teeth and lower lip followed the operation, and what he (Mr. Harding) particularly wanted to know was whether his patient had any chance of regaining sensibility in these parts in course of time.

MR. CHAS. TOMES remarked that if the nerve was merely torn across at one point it would usually readily unite, but if there was actual loss of substance this could not be expected. He had recently come across a cabman from whose jaw he had removed a sequestrum, involving the inferior dental canal, ten years ago, and the man told him there had been no return of sensation on that side.

MR. COLEMAN said that a patient had once been brought to him by a surgeon to have a tooth extracted, a large abscess, which appeared on the point of opening externally, having formed below it. The tooth was extracted, but no discharge followed, and the surgeon then suggested that an opening should be made into it through the alveolus. He (Mr. Coleman) accordingly thrust an excavator through the bottom of the alveolus into the abscess sac; free discharge of pus followed, and the opening on the face was prevented. He thought the proceeding thus suggested to him might be useful to others under similar circumstances.

DR. WALKER mentioned the case of a man who suffered from most agonising paroxysmal neuralgia, affecting the right side of the face. He (Dr. Walker) having removed several carious teeth without benefit, the patient was admitted into Westminster Hospital, where Mr. Pearce Gould exposed and stretched the superior maxillary nerve, but the operation only gave relief for three weeks, after which the pain returned as bad as before.

MR. R. H. WOODHOUSE said he remembered removing at the hospital a sequestrum, showing a section of the inferior dental canal nearly an inch in length, from the lower jaw of a woman. Complete loss of sensation in the parts supplied followed, and the sensibility was never regained.

MR. GEO. PARKINSON said that, in the case he had brought forward, sensibility had not been affected.

DR. ST. GEORGE ELLIOTT then explained the results of his comparative experimental tests of some of the numerous amalgams in general use.

He said he had read a paper in August last, at the meeting of the American Dental Society of Europe, at Cologne, on the behaviour under various conditions of about forty of the most prominent amalgams now in the market; but, not being quite satisfied with the results of some of his experiments, he had objected to their publication until he had had the opportunity of repeating the investigations with increased care and precautions against error.

For the last five months he had been actively engaged in this inquiry, yet even now it was far from being completed. His object had been to obtain some reliable data as to the relative value of the various kinds of amalgam experimented upon, to find out under what conditions they could be used with the greatest advantage, and generally to ascertain how far their properties really answered to the description given of them by their respective makers.

The points to which he had given most attention were, first, with regard to shrinkage, and, secondly, to breaking strain. To ascertain the amount of shrinkage he had noted the variation in the specific gravity of each sample, as shown by a balance which turned at the $\frac{1}{1000}$ of a grain,—contraction of the amalgam being of course accompanied by a proportionate increase of the specific gravity. The breaking strain had been measured by making a number of discs of each sort of amalgam, taking the utmost care that they were all of exactly the same diameter,—each being 7·30 millimetres in diameter, by 1 millimetre (about $\frac{1}{25}$ inch) in thickness,—and subjecting them to a crushing apparatus, the amount of force necessary to effect this being accurately registered and noted. Fifteen discs of each kind of amalgam—viz., five each of dry, medium, and soft—were thus tested, and the mean of the results thus obtained was given as the breaking strain each kind would bear.

The results thus obtained are set out in the following tables. Detailed observations of one amalgam (Sullivan's) are given

in the first table. The method employed for all the others was precisely similar, but as a detailed account of each would occupy a good deal of space, the final results only are given in the second table:—

SULLIVAN'S AMALGAM.

Interval between the observations in hours.	Dry. (mgs.)	Medium. (mgs.)	Soft. (mgs.)
..	1,681·5	1,806·3	1,810·5
12	1,703	1,811·5	1,817·5
3	1,710	1,814·3	1,821·5
4	1,709·2	1,815	1,819·4
4	1,710·3	1,812·2	1,822·5
12.45	1,713·6	1,813·5	1,822·5
4.15	1,715	1,815·5	1,822·5
6.30	1,715	1,812·5	1,822·5
13.45	1,715·3	1,811·5	1,820·2
4	1,710·5	1,811·5	1,818
7.30	1,706·1	1,808	1,817·7
11.30	1,706·5	1,808	1,817·7
5	1,708·1	1,808·3	1,818·2
7.30	1,709·1	1,808	1,820
11.30	1,708·9	1,809	1,818·6
6	1,709	1,811·9	1,827·7
6	1,706·7	1,809	1,818·6
36	1,706·7	1,808·4	1,820·9
4.15	1,707·5	1,809·3	1,820·9
6.15	1,710	1,807·5	1,818·5
Results	— 28·5	— 1·2	— 8
	Contraction.		

	mgs.	mgs.	
The dry contracted	28·5	in 1,681·5	} 7 days.
„ medium „	1·2	„ 1,806·3	
„ soft „	8·	„ 1,810·5	

TABLE OF SHRINKAGE, SPECIFIC GRAVITY, AND BREAKING STRAIN OF 13 AMALGAMS.

AMALGAMS.	SHRINKAGE (—) OR EXPANSION (+)			SPECIFIC GRAVITY.			BREAKING STRAIN IN LBS. (Discs, 7.30 mm. × 1 mm.)		
	Dry. mgs.	Med. mgs.	Soft. mgs.	Dry.	Med.	Soft.	Dry.	Med.	Soft.
Stewart's Sullivan's ..	— 30.9	— 5.2	— 13.5	9.873	12.062	10.342	2	$2\frac{9}{10}$	4
Sullivan's ..	— 28.5	— 1.2	— 8.	10.773	12.651	11.647	3	$3\frac{7}{10}$	$6\frac{1}{2}$
Bonwill's ..	— 24.	— 14.8	— 10.5	8.695	9.202	10.101	$9\frac{1}{2}$	$10\frac{2}{5}$	$3\frac{2}{5}$
Hallam's ..	— 21.1	— 16.3	— 7.5	8.620	9.785	9.288	$17\frac{1}{10}$	10	$12\frac{1}{10}$
Gregory's ..	— 5.	— 6.3	— 13.9	10.127	9.478	10.476	$15\frac{7}{10}$	$10\frac{1}{2}$	$2\frac{9}{10}$
Lawrence's ..	— 23.5	— 6.9	— 5.	9.083	9.174	9.523	$12\frac{1}{10}$	$9\frac{1}{10}$	$2\frac{9}{10}$
Fletcher's Flagg's Standard ..	— 2.6	— 6.6	— 2.	9.690	9.174	9.433	$15\frac{1}{2}$	$5\frac{2}{5}$	$2\frac{9}{10}$
Extra Plastic ..	+ 2.7	— 8.7	— 5.4	9.934	10.510	9.615	$8\frac{1}{10}$	$5\frac{3}{10}$	$5\frac{7}{10}$
" 2nd quality ..	— 18.	+ 14.	— 7.	9.352	9.95	10.359	$6\frac{1}{2}$	$1\frac{3}{4}$	19
Ash's ..	— 10.	— 7.	— 1.	10.115	9.975	13.439	$11\frac{3}{5}$	$9\frac{1}{5}$	$10\frac{3}{4}$
Davis's Gold ..	— 12.	— 5.	— 8.3	9.509	9.97	10.071	$9\frac{9}{10}$	$9\frac{7}{10}$	$8\frac{1}{5}$
" Crystal Gold ..	— 22.5	— 8.5	— 3.5	9.345	10.	10.255	11	10	$8\frac{4}{5}$
Nickold's ..	— 13.4	— 3.	— 3.	9.514	10.05	10.101	$14\frac{1}{10}$	$9\frac{4}{5}$	$8\frac{3}{10}$

It was found that most of the amalgams experimented on continued to change during the whole week, and that during this interval they passed through some very curious variations. The first table gives an illustration of this as regards Sullivan. It was also found that, in order to obtain the best results, some amalgams should be used wet, some medium, and others as dry as possible, these results being sometimes altogether opposed to the directions sent out by the makers. Of course "wet" and "dry" were only relative terms, which could only be judged of by physical characters, and could not be accurately defined. By "dry" he meant that as little mercury had been used as would suffice to make a workable compound; by "medium" he meant the condition in which amalgams were generally used; and by "soft" he meant very soft indeed. Sullivan's amalgam gave the best results when mixed of medium consistence, and was better soft than dry; whilst Ash's was best used soft.

With regard to the so-called "expanding" amalgams, his table showed that this expansion was only obtained under certain conditions, and not under all, as had been generally supposed; thus "Fletcher's Expanding" only expanded when used dry, and not always then.

In testing Stewart's Sullivan's amalgam dry for the crushing strain he had found a curious tendency to lamination in some of the discs, making it difficult to get them to stand any crushing strain whatever,—a tendency which would be calculated to lead to bad results in actual practice.

He thought that some such investigation as that which he had attempted was the only way in which a reliable opinion could be formed as to the relative value of the various amalgams. The results obtained by their use in the mouth afforded a very unsafe guide, since these depended largely on the character of the secretions and the care taken of the mouth by the patient. Nor was the price charged for them any indication of their practical utility. He trusted that the results he had obtained would afford some assistance in this direction, but he hoped to be able to continue his experiments, and in due time to arrive at still more definite conclusions.

MR. BENNETT asked whether Dr. Elliott had made any observations with reference to the shrinkage of palladium amalgam.

DR. WALKER asked whether Dr. Elliott thought that the results obtained were affected by the metal used having been freshly filed, or by the filings having been kept some time.

MR. WEISS said he was glad to find that the investigations of Dr. Elliott confirmed the results arrived at by Hallam thirty years, and by Sullivan forty years ago. The plan had often been recommended of inserting very moist amalgam first, and then taking out the excess of mercury by putting over it an amalgam from which most of the mercury had been pressed out in wash leather. Sullivan, as the result of very careful experiments, declared that this was bad practice, and that to obtain the best results the amalgam should be mixed moderately soft and inserted in this condition. Dr. Elliott's experiments seemed to confirm the truth of this statement, by showing that less shrinkage took place when the material was so employed.

MR. CHARLES TOMES said Dr. Elliott had earned a tribute of praise for the great amount of pains he had taken over this investigation. He had himself some years ago begun a similar inquiry, but had not sufficient perseverance to carry it out; and he was glad to find that in most important points Dr. Elliott's results agreed with his own. His experiments, for instance, showed him that amalgams continued to change for some time after apparently setting. There was, however, one point which Dr. Elliott appeared to have overlooked, viz., that the formation of an amalgam was probably always attended by some rise of temperature; in the case of rapidly setting amalgams the amount of heat produced was very perceptible. This rise of temperature would be attended with expansion of the mass, and so the initial specific gravity would be wrong. He thought that the fact that the crystal gold amalgam had a bad record might perhaps be accounted for in this way, and that it would be useful to make a few experiments as to the amount of heat disengaged

during the first half-hour or hour after mixing. If it should be found that the crystal gold, for instance, gave out a good deal of heat, especially when mixed dry, this might serve to explain the anomaly he had referred to. Whilst he fully admitted the value of Dr. Elliott's investigations, he could not think that the results were strictly accurate. Some of the smaller differences might no doubt be accounted for by experimental errors, but for the larger some other explanation must be found, and he thought that which he had suggested was a very probable one.

MR. GEORGE CUNNINGHAM (Cambridge) remarked that one useful result of such an inquiry as that which Dr. Elliott had undertaken was that it would enable an operator to select for a filling an amalgam which was good as regards shrinkage, whilst for the restoration of contour he would choose one with plenty of edge strength. Professor Flagg had done something to this end, but more yet remained to be done.

MR. WALTER COFFIN regretted that the arrangement of the tabulated results in figures which were not percentages rendered it difficult to judge whether the remarkable variations in the numbers denoting changing density were beyond the limits of experimental errors. The influence of the heat of combination upon the determination of the initial specific gravity was, as suggested by Mr. Tomes, a very important point in the inquiry, but this could not even be estimated until something more was ascertained as to the coefficient of thermal expansion of these alloys, as to which very little was known at present. It was impossible to assign any average amount of crushing strength from only a few results which varied as much among themselves as Dr. Elliott intimated, or even to form an opinion as to the accuracy of the methods employed without a knowledge of these variations. Determinations of the delicacy and difficulty of those undertaken involved, of course, many physical disturbances not recognised at first; and, on the whole, he thought that the results obtained, whilst undeniably testifying to

the immense labour, patience, and ingenuity of Dr. Elliott, indicated an amount of variation from strict scientific accuracy which in their present form it was impossible to estimate.

MR. S. J. HUTCHINSON remarked, that mineralogists were accustomed to judge of hardness by seeing whether one crystal would scratch another. Had Dr. Elliott thought of testing the various amalgams in this way? The test was a simple one, and might possibly afford some useful comparisons.

DR. ELLIOTT, in reply, said no one who had not actually undertaken an inquiry of this kind could have any idea of the amount of time and care required in carrying it out. He had taken the utmost precautions to guard against errors, and although he did not pretend to assert that the results arrived at were strictly accurate, he believed that the errors were not great. At all events, there could be no doubt as to the correctness of some of the broad results arrived at—*e.g.*, that some amalgams, as Sullivan's, should not be used dry, and others not soft. He had not experimented with palladium amalgam, and it would not be very easy to do so, as this compound set very rapidly, and evolved a good deal of heat. Mr. Cunningham's suggestion was a very good one, and indicated another way in which such an inquiry as that which he was endeavouring to carry out might prove practically useful. If one had only a small anchorage for the filling an expanding amalgam should be used, and one that shrank carefully avoided; this was the case also in pivoting. One difficulty with which he had had to contend was the fact that different samples of the same amalgam might differ considerably in composition. Thus he had seen six analyses of Lawrence's amalgam, each of which differed in a striking manner from the others—one observer, for instance, finding a considerable proportion of a metal which some of the others did not find at all, or only a trace of. He had no doubt that the fact that on repeating the same experiments with nominally the same amalgam he obtained each time slightly different results was thus to be accounted for.

MR. COFFIN said he could certainly confirm what Dr. Elliott had just stated. He found the analyses of two bottles of the same amalgam differ so considerably in composition that he thought he must have made some mistake; but on getting the analyses repeated by an eminent chemist very similar results were obtained, showing that the composition of the mixture was by no means uniform.

The PRESIDENT then proceeded to deliver his Inaugural Address, as follows:—

PRESIDENT'S ADDRESS.

GENTLEMEN,

I have to thank you for the great honour you have conferred upon me in making me President of your Society. In accepting this honour at your hands, I have not been free from the apprehensions of failure which attend the acceptance of any onerous position, and if I had followed the bent of my own inclinations I gladly would have made way for some one better fitted for the office. But I also felt the value of your good opinion, and if I had refused to accept this expression of good feeling towards me, and your confidence in me as a worthy recipient of this honour, I should have shown a want of courtesy, and have been guilty of something very like ingratitude. More especially is your spontaneous expression of confidence gratifying and valuable to me when I look back upon the last few years in the history of our profession ; for I well know that when a man fights for a principle, and fights to win, he may unwittingly give offence where he least wished, and where he least meant to have given it. Your conduct towards me has served greatly to dissipate this fear, and has shown me that, even if offence has been given, resentment has not passed within the serene circle of the Odontological Society.

I believe that this Society has acted wisely and well in avoiding politics, and I have always looked upon it as the happy neutral ground in which the hatchet might be buried, and where we might tread the green pastures of peace.

Once in its history has our Society deviated from this strictly neutral course, and even then it may be said to have been more in an educational than in a strictly political aspect,

although the legitimate outcome of that step is the present position of the dental profession. Twenty-five years ago the Council of the Society induced the Council of the Royal College of Surgeons to grant a special examination, and a special diploma, in dental surgery. Since that time, with a calm confidence in the wisdom of that step, and in the fulness of the provision thus made for providing the public with competent and educated dentists, and with a patient waiting for the harvest of the seed then sown, it has avoided active interference in the course of events, and been contented to show the members of the profession what they might be, what they ought to be, and what I believe they all will be ere long. We are not, then, a political Society; neither, let me add, are we a teaching Society. We do not seek to usurp the functions of any school, neither do we seek to patronise one school at the expense of another. We leave the education of the profession to the care of those whose call is to teach pupils, and to reward the diligent. This Society is composed of men who have passed the stage of pupilage, men who have appropriated and digested the teaching of the schools, and who meet together to propound and discuss their opinions and methods. In short, our Society has two well-defined aspects, scientific and social, and in those two conditions we find ample scope for usefulness, and to my mind irresistible claims on the support of the profession at large.

Dentistry is no doubt an intricate and complicated art, and it is to the practice of this art in all its complexity that we devote our ability and strength and time, and in so doing we are liable to be absorbed in our immediate occupation, and mentally to slip away from and to forget the science on which our art is built. Such an occurrence can have but one result. It must dwarf and narrow the intellect, and bring its operation within a limited circle, making men of one idea and one accomplishment. We apply ourselves with commendable ardour to meeting the difficulties of our

calling, and as step by step each difficulty is overcome we begin to marvel at our success, and to think that plugging a tooth is the very acme of human intelligence and dexterity. And so we work and wonder, and then perhaps we call others to wonder with us, and go on wondering more and more.

“ Like Katerfelto, with his hair on end
At his own wonders, wondering for his bread.”

Now our Society draws us out of this circus horse canter. It reminds us that there are hills beyond Ben Primrose, and streams beyond the busy Thames. It keeps us alive to the too oft forgotten conditions which exist around us in our everyday practice; of the dangers and pitfalls which await the most skilful, and which abound for the most self-satisfied operator. It impresses on our minds those physiological and pathological conditions which Art cannot teach, and which it so often fails to alter or to control. This Society quickens our apprehension of such things, and compels us to remember that in our daily work we are hourly in contact with, if not the unknowable, at least the unknown, and that it is only by a devout and patient use of the light flowing from the lamp which Science holds up to us that we can ever emerge from that darkness which Art alone can never remove. And so in the operative part of our art we are reminded by discussion and experience that the materials which we use have their scientific peculiarities and their scientific applications, and that the useful pieces of mechanism which we prepare for our patients must be built up and completed under the light of Science; otherwise we only produce a species of workroom dentistry distressing to look upon, distressing to wear, and discreditable to ourselves.

In this Society I see a scientific centre for dentistry in our country. It is the spot where thought and enlightenment and progress are recorded and made permanent, and from which they are diffused abroad for the benefit of all who care to partake of them. It is the scientific home of our profession,

where the works of past ages are stored and arranged for the use of ages to come.

In our Museum we have a collection of preparations and specimens and appliances of special interest to the dentist, and for completeness unsurpassed by any collection of a similar kind. In our Library is to be found a copy of every worthy modern work on Dentistry, besides a store of ancient literature embracing everything that can be of use or interest to the dental student or the dental practitioner, and also a full assortment of the general medical and surgical text-books of the day. And whatever others say or feel in reference to our profession, I for one am proud to be a humble member of a body which has done so much for itself, without endowment or without fees of any kind, but solely through the energy and liberality of its members. We know that certain Societies have their libraries, but I doubt if any private Society of professional men can show a Museum such as ours. The Royal College of Surgeons has been fortunate in its inheritance of a magnificent collection of pathological and anatomical specimens, and right well has it cared for it and added to it, and made it available for the professional public. But the College is a corporation drawing yearly a large revenue from its privilege of dispensing diplomas. We, as I have said, have no such revenue, and yet we have managed to do this much for ourselves. Surely if, in the early part of our career, we have done so much, we ought to be able to do still more in the future; and if we wish to emulate the past the future is still ours in which we may do it. Meanwhile, through the course pursued by the founders of the Odontological Society, and the action of succeeding Councils, Dentistry has achieved a distinct position in the scientific world—a position which has been, and so far is still being, worthily upheld by its members.

In its social aspect our Society is equally valuable, and I think even more necessary to the well-being of our profession.

Gentlemen, it is a hard matter for many of us to live a professional life. It is hard to walk along the footpath of professional integrity, with the faint shadow of poverty clouding our progress, while the chariot of the charlatan bears him along in ostentatious wealth. But there is this difference between the two conditions: the modest pedestrian passes along quietly in the path of duty, and respecting the unwritten laws of propriety, while the high-stepping horse and big carriage-wheels of the humbug throw up any amount of mud and filth. This is consolation of a kind, but the standard upheld by this Society shuts out the one and admits the other, and the strength imparted by this recognition of integrity and by periodical contact with his brethren does more to support the honest, clean practitioner, however poor he may be, than any amount of philosophy.

I have said that it is sometimes hard to lead a professional life. There are many things to discourage us beside the success of the quack. The general public is wonderfully credulous, and exhibits a capacity for being gulled which seems ineradicable. "Only blow a bubble and you will get plenty to subscribe for soap," said a keen observer of men, and this seems to hold good to any extent with the public in regard to our profession. No promise seems too absurd for even a large number of educated people to believe. Impatience of pain and inconvenience have a good deal to do with this credulity. The promise of freedom from pain hits a great public want, and the promise of such results in a few days, as the honest practitioner knows cannot be accomplished in as many months, is another bait which exactly suits the gullibility of the public; and when all this is capped by a list of fees running far below the possibility of the narrowest margin of profit, the whole allurements is complete. Then, again, there is the commercial character of the age. But few of even the educated classes see the unprofessional nature of advertising. The newspaper press and periodicals of various

kinds encourage it to the utmost, and publish matter in the form of advertisements which they would reject at once if tendered to them in the form of news. The proprietors of any advertising medium never stop to inquire as to the probability or possibility of the statements made in advertisements being true. Probably, in a strict business sense, they are correct, and if the managers of papers tried to do such a thing they would find before them a hopeless task; but I cannot think that the whole moral turpitude lies with the author, when the proprietors of papers preaching morality, and even religion, insert paragraphs into leading positions in their periodicals, puffing some quack medicine, in a form only to be distinguished from general news by the addition of "Advt." in small type at the end, a term which is not likely to be plain to many readers, seeing that extracts from other periodicals are acknowledged in a somewhat similar manner. All this is considered legitimate as a means of making money. Truly the worship of the Golden Calf is not yet extinct, and many are the shrines raised to his honour in this wilderness of London. It is only a week or two ago since the leading journal published a highly laudatory article on the maker and vendor of a celebrated quack medicine, who had spent a large fortune yearly in advertising. The writer was candid enough to say that he did not stop to inquire how far the nostrum possessed all the qualities claimed for it. To an ordinary unbiased mind the marvellous qualities claimed for Holloway's Ointment and Pills would preclude the necessity of stopping to make any such inquiry, but £45,000 per annum spent in advertisements cast a glamour over the mental vision of the writer in the *Times*; and the persistent repeater of millions of misrepresentations and the persistent trader on the credulity of the public, and on the sufferings of humanity, especially in its most painful and hopeless forms, went down to the grave in a halo of glory, because he had endowed two charitable institutions and been

indomitable and unscrupulous in his efforts to make money. I say, Gentlemen, that, in the face of this great public disregard for even what may be called commercial morality, it requires a great effort for any but the most determined or the most prosperous to abide closely within the confines of professional restraints. In this light we can hardly be surprised that a profession such as ours, whose education has been so infamously neglected, and whose ranks could until lately be recruited from the failures in all sorts of trades and professions, should exhibit this vice of advertising and, to put it mildly, reiterating misleading statements to an extent which makes us feel ashamed to be called by the name of dentist. Perhaps this is a false shame; at all events I think that it is a wrong one, for rather ought we to be ashamed of ourselves for having allowed our profession to sink so low without long ago having made a determined effort to raise it at any cost.

Another influence against which we have to contend is the action of, happily, a limited number of members of the medical profession. They seem to think that anything is good enough, or that nothing is bad enough, for dentistry, and although they would shrink with horror from one of their own branch of the healing art adopting certain methods of obtaining notoriety, they see nothing wrong in a dentist doing so. They thus, by their countenance and support, do their best to encourage the advertising dentist.

Gentlemen, these are a few of the influences which tend to make it hard for many of us to lead a professional life, and I think that the social influence of our Society is as a tower of strength amongst us. We keep each other in countenance; we support each other in the midst of much discouragement; we know that if patients be going to a strange place that we will not disgrace ourselves, nor lay them open to unprofessional treatment, if we can send them to a member of this Society; and I think we may feel satisfied in saying that year by year our difficulties will grow less, and that as our ranks

are gradually filled up by educated men, and the dental diploma becomes more and more appreciated, the professional spirit will be more and more diffused and become permanently established among the profession at large.

Gentlemen, I have tried to show that our Society has certain well-defined functions. I need not detain you to point out to you how well it has discharged them from the time of its formation until now. If I can hand to my successors those valuable traditions unimpaired in their integrity, I shall consider that I shall be making you the very best return which my gratitude can devise for the honour you have done me in making me your President.

There are one or two additional matters to which I should like to draw your attention, if you be not already tired of listening. This Society is, I believe, firmly established, and although our late energetic President seemed to be in rather a desponding mood, owing to the few additional members we had last year, I am convinced that the more the advantages offered by this Society are known, and the more its influences become appreciated, the better will it be supported. I am also convinced that the wider the diffusion of education amongst us, the more will dentists appreciate the necessity for such a centre as this Society provides, so that the dental profession may be kept before the professional public in its proper aspect.

There is another point to consider in estimating the number of last year's recruits. The resolution of the Council, endorsed by the Society, excluding all from membership who do not hold a recognised diploma, is now in full force, and its operation has necessarily reduced materially the number of those who might have become our supporters, and thus may have had some influence on the number of new members who have joined the Society. Seeing that this resolution was passed with the view to support and raise the value of a legal qualification amongst us, we may anticipate

that those who become possessed of a diploma will not be slow in taking advantage of this exclusive privilege presented to them.

But, gentlemen, numbers alone will not avail us. With numbers we require personal interest and mental activity; we want a sense of responsibility to possess each individual member of this Society. However largely our meetings may be attended, they will soon cease to be interesting if the majority be content to sit as lay figures while the same members night after night are left to represent the mental activity of the profession. And yet I cannot help realising the fact that the existence of this state of things in our midst is being forced upon one, however reluctantly I may receive it.

In proportion to our increase in numbers, the proportion of new speakers and of new writers is very small indeed. Surely improved education has not made such baneful strides amongst us as to quench mental activity and individuality. Surely the elevation of the dentist and of the dentist's assistant, and the comparative ease with which a successful dental student can now find a position, is not going to rob our rising generation of practitioners of all sense of moral responsibility to their profession. Is the old truth to be extinguished by the light of a new philosophy of selfishness, and the solemn text, "Where much is given much shall be required," to be travestied into "Where much is given, much more shall be wanted"? Is education to produce a race of ease-lovers—lovers of pleasure and lovers of self? Then I say, Stop education before it work such dire evil; arrest it, I say, before it has worked this evil, otherwise it will assuredly be choked by the rank vegetation of its own production.

I cannot, however, as an advocate of education, believe that such will ever be its permanent results, but I do believe most firmly that, if the advantages and powers which it confers be allowed to run to seed, or be retained for personal

or selfish ends, and be not dedicated to the general weal, another and more energetic race of practitioners will arise who will startle the idle and indifferent from their selfish and short-sighted lethargy, and, occupying the front ranks of our profession, seize as their reward, and as their right, the honours and emoluments which belong to self-sacrifice and energy and public spirit. I would remind our members that the honour of reading a paper before this Society is one which is not despised by gentlemen of position in science and medicine. Shall it then be said that we ourselves are the last to appreciate this honour? Or shall it be said that we lack the ability, or the literary industry, or the confidence in ourselves, to provide the necessary matter for our meetings? Surely the possibility of such a disgrace should not be within the bounds of imagination, if we appreciate aright our position and our privileges. And yet I am bound to utter the disagreeable impression I have, that it looks as if the literary activity in our ranks which has made our transactions so valuable is sadly on the wane, and appears in danger of becoming extinct.

I am not blindly bound to read papers as being the only pabulum from which our mental activity should be fed. I consider a meeting devoted to a series of short communications, unfortunately termed casuals, has capabilities for instruction and pleasant interest, even beyond that of one especially devoted to a set paper; but what I do maintain is that when a set paper is wanted it should easily be found within our own ranks. I am fully aware of the value of papers from professional and scientific gentlemen other than dentists, but what I want is that those papers should be sought for their own value, and as a means of keeping up our intercourse and connection with the scientific and medical world generally, and not because we cannot supply the want from amongst ourselves.

I think that the matter of casual or minor communications

requires a little consideration. We must all have noticed that communications of much interest have again and again been slurred over, and that many an interesting discussion has been burked, because a set paper was waiting to be read. To avoid this I think if gentlemen who have communications to make could give our Secretaries an approximate idea of the time likely to be occupied by them, they would greatly assist those gentlemen in arranging the business of the meetings. In like manner, if the readers of set papers would state the length of time they would occupy in delivering them, the reception of minor communications could be regulated accordingly, and so a valuable economy both in time and materials might be achieved.

The discussion method is another means of making an interesting evening. It is not, however, within the power of many of us to open a discussion fluently and connectedly, and without a certain amount of repetition, which becomes irksome to the listeners. I prefer, if possible, to be able to pin a man down to what he has said, by having a paper for reference, and it seems to me that if the materials for starting a discussion are at hand, it is an easy matter to put them on paper and so avoid such errors and omissions as belong to all oratorical efforts but those of the most fluent and practised speakers. Still if the inclination of the members tend in this direction, I shall only be too happy to support it to the best of my ability. What I long to see is an amount of intellectual activity amongst us commensurate with the position which we assume as an educated and scientific Association of professional gentlemen. It would be unbecoming in me to specify how readily every member might find the means of helping to make the transactions of the Society interesting, but I may venture to point out a fallacy which I think is rather prevalent amongst us—that is, the necessity to be original. Originality is, happily I think—for we are far from having used up the materials we possess—a

rare gift. It is not originality that keeps the world moving. Originality seldom makes its immediate mark in its own time. Its general reward and appreciation lies in a period subsequent to its existence. What is really wanted for our purpose is an appreciation of the opinions and methods which are in vogue around us, which permeate, as it were, our professional atmosphere, and float about in a hazy, indefinite way, without shape or colour. These must be gathered together and embodied into a tangible form, which can be handled and examined, and which will in its turn become a nucleus which will proliferate and throw off other cell germs to await the harvest of the future observer. Now this nebula of half-formed opinion and half-formed facts which for ever pervades the intellectual atmosphere of the world also pervades the individual intellect, and is one of the sources to which we must mainly look for the materials which will supply our meetings with matters of interest. It is to be found either in the application or modification of ascertained facts, or in gathering together and defining the form which our own opinions and the opinions of others may have assumed under the influence of practical experience and thought. If we all try to do this, giving to the task the necessary time and labour—for such things are not done by inspiration—we will go far to maintain the high standard of our transactions, and in some measure discharge the debt which we owe to those who have worked and toiled for us in times when the resources of Science and Art were more limited than they are now.

The subject of the regulation of our meetings naturally leads us to the regulation or government of our Society itself. Formed as this Society was at a time when we were only nominally a profession, and by a few gentlemen who had made for themselves a professional reputation and position despite the odour of charlatanism which surrounded the name of dentist, it was necessarily based on what at that time was con-

sidered a restricted and conservative model. But if we look at the matter fairly, we must see that the whole arrangement was characteristic of the founders. The conditions of membership were at once liberal and enlightened, and simply required that any one practising dental surgery should do so in a professional manner. It was left to us to further limit the field of membership, and whether this has been done at the dictates of a narrower spirit than that which animated our founders, or in answer to the higher educational status of our profession, is a question which will perhaps be best answered by the course of events rather than by discussion. But, either way, we cannot but admire the prevision of those gentlemen who could formulate a set of rules requiring so few modifications during a trial which has extended over a quarter of a century. If, however, the Society has been more conservative on one hand, it has been more liberal on the other, and recognising the increase of provincial members, has, by a slight alteration in the Bye-Laws, made it possible to elect a President from the non-resident members; and in the election of office-bearers, the non-resident members can now vote by sending in their balloting papers through the Chairman. Other changes have been suggested from time to time, but the influence brought to bear upon the Council has either been misdirected or too feeble to call for any special notice or response.

It is nevertheless true that an amount of discontent exists amongst a few members on certain points of administration. The officials of the Society, although elected by ballot, have been accused of cliqueism. I am not going to argue this matter in detail, but I would ask those gentlemen who have harboured such thoughts to analyse the Council list for the last few years, and see if the changes in the list of office-bearers have not been as frequent as is compatible with the safe government of an institution such as ours, the management of which involves, in many instances, the administration

of phases of law which, though unwritten, are tacitly understood by those who have gone through all the stages of service on the Executive. Charges of nepotism have been whispered against the Council. I grant at once that there are two or three gentlemen on the Council whose fathers too have served in the capacity of Councillors, and who have also been Presidents of the Society. But it is now some considerable time since these latter acted in an official capacity, and I should be sorry to think that this Society should be deprived of the services of fit persons, because they happened to bear time-honoured and work-honoured names. I think that the last two Presidents of the Society point to another conclusion, for neither of these gentlemen had any forerunners to recommend them, and as for myself I can only say that "it is a far cry" from the work-bench to the Chair of the Odontological Society, and yet, gentlemen, that journey has been completed to-night; and in my opinion a Society which has a record such as this cannot be fairly taxed with either cliqueism or nepotism.

Another murmur which has found expression in the pages of some of our journals is about the admission fee and the annual subscriptions of members. The Society, it is urged, is rich, and so the expense of membership should be reduced. I would suggest that if the Society be rich it has become so on the subscriptions of those who have been members from the first rather than on ours. But, gentlemen, is it rich? I much doubt it. The measure of an income is the charge upon it, rather than its actual amount. Time was when the Vicar of Wakefield was "passing rich on forty pounds a year." His present successor would be passing poor on four times that amount. And so it may be with our Society. Our funds have increased chiefly through the extra subscription charged to the London members.

We hear it frequently said by provincial dentists that as they cannot attend the meetings they don't think it worth their while to join, and lately we have had a resignation

for this reason. I think that the remarks which have been made should dissipate such views, for if I am right in my interpretation of the functions of the Society, its advantages must accrue to the profession generally. But I venture to think that the monetary objection is still more untenable than the inability to attend meetings. The monthly meetings are no doubt the most essential part of our business, but their attendant expenses are but a small part of our outlay, and beyond those expenses the benefits of the expenditure are shared equally by all. But what are the reputed riches of the Society? A vested sum of £2,000. Now, gentlemen, the time may not be far distant when the demands of the Dental Hospital and School may necessitate our removal from our present quarters, and but for the liberality of Sir Edwin Saunders it might have become the pressing question of the day with us. And although the pressure has passed away that is no reason for us to suppose that we are fixtures. On the contrary, the warnings which we have had should teach us to be, as far as possible, ready for such a contingency. I have alluded to the valuable Museum and Library we hold in trust for the profession; now I would ask, are we to rely upon the chapter of accidents for its preservation in an emergency? Or are we, like prudent stewards, to prepare for what to me seems the inevitable, and be ready, so far as we may, to provide a worthy home for them and for our Society? Gentlemen, I need not seek to answer such a question, and I believe that, as your President, I shall best meet your opinions and consult the interests of our Society, and of the profession at large, by acting in accordance with these views, and with your support it shall be my endeavour so to do.

VOTE OF THANKS.

MR. THOS. ARNOLD ROGERS then proposed a vote of thanks to the President in the following terms :

“The circumstance that I am unable to be present often must be my excuse for addressing you now. I much wished to have been here at the last meeting, in order to have proposed or seconded a vote of thanks to the retiring President, but it was not possible. It is a consolation to me, and must be so to him, that it was much better done. Nevertheless I should have been pleased, as a very old friend of Dr. Walker, to have taken some part in tendering our thanks to him. As that was out of my power, I will beg your permission to offer our cordial welcome to his successor, and our thanks for his spirited and able address.

“It is not in accordance with our usual forms to hold a debate on the address; and I can, therefore, allude only in very general terms to some of the topics of the President’s speech. There is one on which I should like to say a few words, as being, perhaps, the greatest sinner, and therefore anxious to relieve my conscience. I mean the reference to the notion of nepotism in the formation of the Council lists, but which can scarcely, I think, be held by any who have taken part in their formation. The principles which guide the Council in the selection of names are—speaking broadly—services rendered to the Society or Profession, marked promise of ability, professional and social position, and length of membership. In addition to these it has been held desirable to retain some of the original founders of the Society, who are, therefore, supposed to be imbued with its traditions, and especially anxious for its welfare. I can but add that those oldest members, whilst always ready to give themselves up to your service, are equally desirous to give place to the

younger men, and, indeed, are, more often than not, persuaded to remain or to return by the kindly wishes of the younger men themselves—whether as interesting and curious specimens of a past age, or as still possessing some useful qualities, I would rather not express an opinion. But this I can say, that whilst you think they are of any use they are glad to do what lies in their power, and when you think fit to dismiss them, they will still continue to watch with pleasure the growing edifice of which they laid the foundations, and which is amply fulfilling the hopes they entertained.

“The other subject on which I should like to speak is that of the financial condition of the Society, and I would entreat those who wish to reduce the subscriptions to consider the peculiar position of the Odontological Society in the dental profession. The College of Surgeons is, of course, our headquarters, as of every department of surgery. But whilst that body has always accorded us the very utmost consideration, we cannot expect that their other professional interests should be absolutely subordinated to ours. Yet we do need a central institution where dental philosophy and science shall hold the first place. And we can look nowhere but to the Odontological Society for this. The British Dental Association has, and probably always will have, quite enough to do in the care of our material and political well-doing. It is to the Odontological Society we must look for the far higher work of the promotion of scientific dentistry. I do not like the prevalent notion of caring only for our own time and letting the future care for itself. If our predecessors had so done, how should we stand now? Certainly those who founded this Society, and those who have hitherto guided it, have not been so actuated. They were content to make many sacrifices with no hope of seeing the result, but with earnest faith in the future. And I sincerely hope this spirit will continue among us. The greatest possible service that could be rendered to dental surgery would be the foundation of a purely scientific Professorship, sufficiently endowed to attract corresponding men among ourselves to Owen and Flower in general Surgery. I can imagine nothing better calculated

to raise our profession to its highest pinnacle. But whence can this endowment come but from the Odontological Society? And how can it be obtained but by the patient, self-denying, accumulation of years? Already a slight and accidental increase of expenditure has changed our surplus into a deficit. And it must be remembered that—wisely, as I think—we now recruit our members from a limited field, and can scarcely expect to compensate for a lower subscription by a proportionately larger list of members.

“I beg, Sir, to offer you our best thanks for your very excellent address. We old Presidents always listen with a certain anxiety to the note sounded from the Chair on its first assumption by a new occupant. And when, as now, there comes no uncertain sound, we go on our way rejoicing. I think we shall probably have a more pleasant season than in that ‘other place,’ where debates are permitted on the Address from the Throne; and we probably shall not, as is promised there, ‘begin fighting, continue fighting, and end fighting.’”

MR. CHAS. TOMES said he was very glad to have the opportunity of seconding the resolution. The fact that Mr. Turner had been intimately associated with his (Mr. Tomes's) father in the momentous events of the last few years was known to all, but how great a sacrifice of time and strength Mr. Turner had made during the progress of those events was known only to few; but it was a fact that a great deal of Mr. John Tomes's work was only rendered possible by the self-denying and self-sacrificing efforts of the President.

With regard to the address, he would only remark that its outspoken courage was characteristic of its author. He had boldly discussed certain moot points in the economy of the Society, which had for some time past been bandied about amongst its members, but the public recognition of which many men would have been disposed to shirk. In conclusion, he would assure Mr. Turner that he would endeavour to bear in mind the hint given in the address, that certain members were too often on their legs at the meetings.

The resolution having been carried with loud applause,

The PRESIDENT expressed his thanks, and adjourned the meeting.

After the meeting, Mr. J. Tate, the agent of the Patented Improvements Company, of Broad Street, Birmingham, gave a demonstration of the advantages of the Albo-Carbon Gas-light, and its suitability for the requirements of dental practitioners.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

March 3rd, 1884.

J. SMITH TURNER, M.R.C.S. and L.D.S.Eng.,
PRESIDENT, IN THE CHAIR.

The Minutes of the previous meeting having been read and confirmed,

The PRESIDENT announced that the following candidates for election had been duly nominated, and would be balloted for at a subsequent meeting, viz. :—

MESSRS. EDWARD BARTLETT, M.R.C.S. and L.D.S.Eng., 38,
Connaught Square, Hyde Park;
WILLIAM FORESTER, L.D.S.Glas., Clyde Villa,
Temple Street, Barford, Stoke-on-Trent;
JOHN H. MCCALL, L.D.S.Eng., The Spa, Leicester.

MR. WEISS (Librarian) announced that Mr. H. C. Quinby had forwarded a copy of his recently published work entitled “Notes on Dental Practice” as a donation to the Library.

MR. S. J. HUTCHINSON (Curator) showed a very fine specimen of the skull of the common ox, with the dentition complete, which had been forwarded as a contribution to the Museum by Mr. J. T. Browne-Mason, of Exeter. He added that it was a remarkable fact that until this skull was received the only specimen illustrating the dentition of the ruminants which their Museum contained was the imperfect head of a cow. He was very anxious to form a series of

preparations illustrating the progress of dentition in the ox and horse from the very young animal up to the age of five years, and he should feel greatly obliged if any of the members who might have the opportunity of obtaining suitable specimens would kindly assist him by keeping his wants in mind.

MR. W. HERN read notes of three cases of Defective Development of the Temporary Teeth, and showed models of the patients' dentition.

The first case was that of a boy, aged seven, of fair complexion, and rather undersized for his age, having rather a large head, with prominent forehead, and a curious "old" expression of countenance. In his *lower* jaw he had only four teeth, which Mr. Hern believed to be the second temporary and first permanent molars. In front of these teeth the alveolar margin presented a slightly elevated, but very narrow ridge, consisting chiefly of soft gum tissue which could be moved with the finger and thumb, and there were not only no teeth but no signs of a germ. The *upper* jaw contained six teeth, four of which corresponded to those in the lower jaw, viz., second temporary and first permanent molars, the other two being somewhat pointed caniniform teeth situated in the incisor region, and placed about a quarter of an inch apart; these he believed to be incisors. Their buccal surface was almost denuded of enamel, and was softened by caries; the alveolar ridge between them and the molar teeth was narrow but firm. Situated in the vault of the palate, and occupying a position on each side of the median ridge, were two peculiar elongated depressions, which diverge somewhat as they pass forwards and become lost on the lingual surface of the alveolar ridge. The child first came under his notice about three years ago, when the mouth presented (as far as he could remember, having temporarily mislaid the models then taken) appearances precisely similar to those then shown, with the exception that the first permanent molars had since erupted. The child's mother stated very positively, and apparently truthfully, that he had never had any other teeth

than those then *in situ*. He had never been a strong boy, having suffered from rickets when young, but he had never suffered from any severe illness. The front teeth were cut when the child was about a year old; the back teeth much later, but the exact period could not be remembered. The father was said to be a healthy man with good teeth. The mother was also healthy, of rather dark complexion, and had no abnormality in either the number or position of the teeth. She had one younger child, a boy aged four, who has, she says, "beautiful teeth." There were no other children, and no evidence of specific disease.

Mr. Hern remarked with reference to this case that from a developmental point of view, remembering how the ten front permanent teeth derive their enamel germs from their temporary predecessors, he was inclined to think that if these latter were absent the probabilities were that the permanent successors would be absent also, to which view the very narrow and almost foetal condition of the alveolar ridge anterior to the molars in this patient seemed to lend weight. But on looking into the text-books for guidance he was surprised to find a case mentioned by Mr. Tomes, in his "Manual of Dental Surgery," in which the temporary teeth were wholly absent, with the exception of the right second lower molar, and in which the permanent teeth not only made their appearance at the usual time, but took their places with unusual regularity of arrangement. The perusal of this case had given him somewhat more favourable expectations with reference to the possible future of his own. He had hoped to have had the boy present for inspection, but owing to the parents having recently changed their address, he had (temporarily he hoped) lost sight of him.

The second case was that of a boy aged six, the eldest of a family of three children, and a small, ill-developed child for his age.

The models he had sent round would show that the lower jaw, which had rather a small arch, carried nine temporary teeth; the canines and both the molars were *in situ* on each side, and occupying the space anterior to the canines were

three small conical teeth, slightly separated from one another. The canines were well developed, with sharp, rather elongated cusps.

In the upper jaw there were eight teeth, set in a fairly good arch, the lateral incisors only being absent. The enamel and dentine of these teeth were of good quality, and they were tolerably well formed, with the exception of the central incisors, which were small, poorly developed teeth, separated by a space of about three-sixteenths of an inch.

The third case was that of a boy, aged four, brother of the last-mentioned. He was also a diminutive child for his age, with light complexion, blue eyes, and rather scant silky hair. He had only six teeth in the lower jaw, viz., the two temporary molars, and the canines on each side. The canines were large and strong, with slightly recurved cusps; the molars had also a tendency to elongation and pointing of their cusps.

In front of the canines the alveolar ridge is narrow and destitute of teeth. In the upper jaw there were eight teeth, the lateral incisors being absent as in the case of the brother. The central incisors were also similar to those of the elder brother, being poorly developed and standing a quarter of an inch apart; the left central was loose. The canines, as in the lower jaw, were large, with strong, sharp, and slightly recurved cusps. The mother stated that these children had never had any more teeth than those mentioned, none having been extracted. Both were late in cutting their teeth, the eldest not having any until he was fifteen months old, the younger rather earlier. The father is a healthy man, aged thirty-two, rather below middle height, but well proportioned; scant hirsute development on the face. No history of syphilis. On examining his mouth the right upper central was found to be absent; the left, which is still *in situ*, being small and conical. The mother is a small, rather pale woman, aged twenty-eight, of dark complexion. No abnormality of teeth; had always enjoyed good health. Besides the two children referred to she has one other, a boy aged two years, whose temporary teeth were found to be normal, both in number and position.

In an elaborate and highly interesting paper read before

the Society by Mr. Moon about seven years ago, cases were mentioned (models of which are figured in the Transactions) of defective dental development occurring in several members of two different families. Mr. Moon there remarks on the feeble dermal development of these children, and on a tendency in the teeth present to elongation and recurvation of their cusps, this being specially marked in the canines and molars. This elongation of the cusps was explained by Mr. Moon on the view that, according to the "normal architecture of the teeth," the different forms are due to a multiplication and modification of one simple elementary tooth-form or denticle. A normal front tooth has three such denticles, but under disturbed conditions of development, a remarkable development of the central cusps or denticle takes place, and a diminution or suppression of the others, resulting in the simple pointed teeth met with in these cases.

On comparing Mr. Moon's cases with those he had brought forward, one factor was found to be common to nearly all, viz., that the defective development was found chiefly, or almost exclusively, in the older members of a family; the younger usually enjoying a normal dentition. In this respect, the cause of the defect seemed to run on parallel lines with what was known of the manifestations of hereditary syphilis on the teeth. Contrary, however, to the effects of mercury (stomatitis), which chiefly involve the enamel, and of syphilis, which particularly affects the dentine germ, the results of the acting cause in such cases as those just exhibited seemed to be a general dwarfing of the whole germ, rather than of its component parts, the quality of the enamel and dentine being in the majority of these conical teeth decidedly above the average.

The conclusion to which Messrs. Moon and Jonathan Hutchinson came to with regard to the cases brought forward by the former, to which allusion has been made, was that the peculiarity of tooth-form was referable to a lowered degree in the scale of development, which was shared in by other dermal structures. Although the signs of feeble dermal development were not well marked in the cases of the

children now brought forward, yet there were indications of such a condition, and in the absence of any other indication, he (Mr. Hern) was inclined to consider the cases as similar in origin, the children inheriting from the father's side a predisposition to the conical form of teeth. He should be glad to know whether any other members of the Society had ever met with similar cases, and to learn their views respecting them.

MR. CUNNINGHAM (Cambridge) read the following notes of a case of replantation.

"About 7 p.m. on November 15th, Mr. E. A., an undergraduate, called to make an appointment for the following day. Being informed that the patient was in pain I went in to see him, and found he had had his left upper central knocked out at football between two and three that afternoon. He had come with the view of having an artificial tooth inserted, but finding that he had picked up the tooth and that it was otherwise sound, I proposed to make the experiment of replantation. The circumstances did not appear very promising, as the tooth was not in a very clean condition, and seemed almost entirely stripped of its periosteum; to what little portion there was the paper in which the tooth had been wrapped was adhering. After washing the tooth carefully in carbolised water, a small portion of the end was filed off, and the nerve canal and pulp cavity cleaned as well as circumstances would permit. A very minute dressing of oil of cloves and arsenious acid was placed in the pulp cavity and covered over with oxychloride stopping, the final portion of the nerve canal being finished off with a gold filling. The socket, which was considerably lacerated, was syringed with carbolised water, the tooth meanwhile remaining in a tepid bath of the same liquid. Luckily, as it turned out, all the assistants had left the laboratory, and I was thrown entirely upon my own resources for the manufacture of a splint. After twisting a couple of strands of silk round three incisors to form an attachment, a large quantity of fossiline was quickly mixed, and holding the tooth in position—considerable

force being required to keep it there—a mass was applied and moulded with oiled fingers and instruments round the four incisors, both on the labial and palatal surfaces, carrying it well up to the margin of the gum; the entire mass and gum was then painted over with varnish. This part of the operation, from forcibly holding the tooth in position, caused considerable pain, which diminished as the evening advanced. Poppy fomentations with potassic chlorate powders were prescribed, but the patient failed to make any use of them. On the following day the patient represented the tooth as being quite comfortable; the gum, however, presented rather a purple turgid appearance. On the 19th instant the patient presented himself again, and all seemed to be going well. On the 24th the patient reported that the fossiline splint had broken away during the night, just six days after the operation. The tooth and surrounding structures presented a perfectly healthy appearance, though it was still very loose. It was thought advisable to take the precaution of renewing the splint, and the patient was directed to show himself again before going down for the Christmas vacation. This, however, he failed to do, but he wrote to say that about December 23rd the splint gradually broke away, and that the tooth seemed quite firm. The patient has kindly consented to come here to-night for your inspection. The tooth will be found to be perfectly firm, and though slightly elongated, appears otherwise healthy.”

The patient then came forward, and the result of the operation was inspected by most of those present.

MR. ACKERY said he had lately had two cases of replantation, which might be worth mentioning, since both presented some unusual features.

The first was that of a girl, aged twenty, who came to the Dental Hospital complaining of pain in a right upper central. The tooth was found to be loose, was protruded forwards quite out of line, and had descended at least three-sixteenths of an inch; it was very tender on pressure, and there was constant discharge of thin purulent fluid from the socket behind the

tooth. The patient stated that a "gum-boil" formed in this situation about three years before, and that there had been constant discharge since; the displacement had also been going on ever since that time. On November 29th the tooth was removed; it was found to be denuded of periosteum over most of the palatine surface of the root, but a small patch of fairly sound periosteum was found at the apex, and the anterior surface was fairly healthy; the bare parts were surrounded by very thick vascular tissue resembling pyogenic membrane.

The tooth was drilled through from the crown to the apex of the root, and returned to its alveolus, which had been well syringed with carbolic acid solution, and a portion of the posterior edge removed with a large vulcanite-cutting burr. The tooth was pushed into as good a position as possible, and kept in place by a small vulcanite plate with a platinum guard bent over the cutting edge. The plate was tied in, and the hole which had been drilled left open to act as a drainage tube.

On December 6th, the parts looked healthy: there was no discharge, and the gum seemed closing up round the tooth, which was, however, still very loose. On the 13th the tooth was in good position and seemed firmer. On January 31st the tooth was found to be fairly firm, but had fallen nearly an eighth of an inch. Patient had left off the plate just before Christmas. The pulp cavity was cleared out and some eucalyptus oil inserted on cotton wool, which the patient was told to change daily. The cutting edge was then ground down to the level of the neighbouring teeth. The patient appeared much pleased with the result of the experiment, but Mr. Ackery added that, considering the very unfavourable conditions, he could not help feeling great doubts as to the permanence of the result.

The other case was that of a girl who came to him on a Tuesday at St. Bartholomew's Hospital, where he happened to be seeing Mr. Ewbank's patients, on account of hæmorrhage from the socket of a lower molar which had been extracted on the Saturday previous (sixty-two hours). The alveolus had

been plugged twice, but without permanently arresting the bleeding. The patient brought the tooth with her, and Mr. Ackery, thinking it would make a capital tight-fitting plug, replaced it just as it was, without removing the pulp or filling the canals. The hæmorrhage was immediately arrested and did not recur. During the two following days there was distinct periostitis, which, however, soon subsided, and when seen again fourteen days after the operation, the tooth was quite firm and free from tenderness.

MR. WEISS remarked that a very important point in connection with these cases, supposing the immediate results of the operation to be successful, was how long would this state of things last. This was rather a difficult question to answer, for he did not know of any data sufficiently accurate and extensive on which to found an opinion. A case had occurred at the hospital about seven years since which had been more than once referred to at the Society's meetings, and of which he could now give the sequel. It was that of a young man who presented himself with the right upper lateral crowded out of line, whilst the left was destroyed by caries. The stump of the latter was removed and the tooth from the opposite side put in its place. It became firm and useful, and remained so for about six years, when it became loose, and recently the patient had called to tell him that the tooth had come out. His own opinion was that in the great majority of cases of replantation, a longer duration than this could not be expected.

MR. COLEMAN said he had replanted a tooth for a gentleman, who was then a student at St. Bartholomew's Hospital, and he knew that it was firm and useful at the end of six or seven years. He thought that, considering that the operation was not usually attended with any great amount of pain or inconvenience, the prospect of retaining a useful tooth for six years was quite sufficient to render the experiment worth trying.

DR. FIELD said he had operated in ten cases, in all of them as a last resource,—cases of obstinate fistulæ and incurable abscesses. He could not say that he had kept them all in

view, but he knew that one of these replanted teeth was still firm and useful three years after the operation. He believed that five or six years would be found to be about the average duration of apparently successful cases, and he thought this quite sufficient to justify the operation, especially in the class of cases he had referred to.

MR. NEWLAND PEDLEY remarked that it was stated in textbooks that the reason why ankylosis between the jaw and the teeth did not occur in the human subject, was owing to the interposition of the periosteum. In Mr. Ackery's case the tooth seemed to have become firm, although the periosteum had disappeared, might not ankylosis occur under such circumstances?

MR. COLEMAN replied that in the course of some experiments in replantation performed on dogs by Misterlich of Vienna, it was found on killing the animals after some time that ankylosis had taken place, in some cases to a considerable extent. Such an occurrence was, however, exceedingly rare, to say the least, in the human subject. Generally speaking, a tooth of which the periosteum was destroyed had no better prospect of becoming properly united with the jaw than if it was an ivory peg.

MR. STORER BENNETT said he could not see how ankylosis could possibly take place under the circumstances referred to. When two pieces of bone unite vessels exist in each, a vascular network is developed from each, and osteoblasts form. But no vessels would develop from the tooth, and those which formed from the wall of the alveolus, coming against the bare surface of the tooth, would be more likely to cause absorption of the latter than to lead to bony union.

MR. STOCKEN said that with reference to the duration of replanted teeth, he would mention two cases which had occurred in his own practice. In the first a central incisor was removed, stopped and replaced, but not secured. It dropped out, and when he saw the patient again it had been out for two hours. However, he washed it with some carbolic acid solution and replaced it, tying it in this time. At the

end of a week it was quite firm, and three years later was still a strong useful tooth, and not discoloured.

The second case was one in which he extracted a lower incisor on account of an intractable fistula of two years' standing, took off nearly a third of the root, filled and replaced it; it soon became firm, and had remained so up to the present time, *i.e.*, for five years.

The PRESIDENT remarked that replantation was always a prolific topic for discussion whenever it was started; but it appeared to him that these discussions did not lead to much result—they seemed to move in a circle. The precise elements which led to the success or failure of any given case seemed still to be uncertain, and in fact he believed that we were still but little in advance of John Hunter even now. The mention of John Hunter reminded him that there was a member present who had very carefully studied that author's writings, and who had some years ago published a very interesting paper on this subject in the *Lancet*.

MR. VASEY said that as a young man he had read the account given by John Hunter of his attempts to implant human teeth in the cock's comb with great interest, and was puzzled to account for his want of success, for out of forty-three or forty-four experiments only one succeeded. Hunter himself gave no reasons to explain his success or failures, nor did he state the age of the patients from whom the teeth were taken. But he (Mr. Vasey) at last came to the conclusion that the tooth which united must have been a young tooth, and that the others failed because they were not so. Some time elapsed before he had an opportunity of verifying this conclusion, but at length he was able to examine Hunter's specimen, and found, as he had expected, that it was a young upper canine with the root scarcely formed, and it appeared to him that the union had taken place, not between the comb and the tooth, but between the comb and the pulp. He was surprised to find that Professor Owen, in speaking of this case, attributed the union to the presence of cementum, but there was no cementum present. He thought that the age of the patient was an important point in connection with

operations of this sort. Thus with regard to torsion, it was attended with very little risk in the case of a young tooth, but if the root was fully formed the chance of failure was considerable. The root might not be quite straight, or it might be much compressed, and then the tooth would become prominent owing to the long diameter of the root being brought into the shorter diameter of the alveolus.

MR. GADDES remarked that Hunter's specimen was figured in the "Monthly Review of Dental Surgery," about four years ago, from a drawing made by Mr. Boyd Wallis, of Brook Street.

MR. CUNNINGHAM said Hunter's experiment had been repeated with success by Professor Stellwagen, of Philadelphia, and he could state from personal knowledge that the tooth implanted was fully formed; if his memory was correct, it was a bicuspid.

MR. COLEMAN said he was under the impression that Hunter had succeeded in several cases in getting attachment between the tooth and the comb, but there was only one case in which he succeeded in proving a vascular communication between the two, by the passing of injection from the comb to the pulp, and that was the specimen to which Mr. Vasey had referred.

MR. ALFRED SMITH exhibited for Mr. Arthur Underwood a model of the upper jaw of a child thirteen years of age, showing two supernumerary teeth behind the incisors; these were not, however, of the usual conical shape, but rather resembled bicuspids. The dentition was otherwise normal and complete.

MR. R. H. WOODHOUSE read the following communication from Mr. C. W. Dunn, of Florence, describing his method of supplying crowns to broken or carious teeth.

A New Method of supplying Artificial Crowns.

By C. W. DUNN, L.D.S.Eng., Florence.

VARIOUS ways have been tried to restore the form of teeth which have been broken or destroyed in part, more or less, by the result of decay or accident. Skilful operators have supplied this want in some measure by contour fillings, but although their efforts have excited admiration for their dexterity, yet the result has been unsightly ; a building up of the lost portion of an incisor tooth, if it be a large portion, can be distinguished from one side of the street to the other.

Pieces of enamel, or mineral stoppers, have been prepared by the manufacturers of mineral teeth, but those that I have seen and used leave much to be desired.

For several years I have been trying to attain a still nearer approach to a natural appearance, by accurately filling the cavity of the tooth with a piece of mineral tooth, chosen with regard to its colour, or with a piece of enamel cut from a human tooth, or from that of an animal, such as the tooth of a lamb or sheep.

In preparing the piece of enamel, it must always have as long a shank as the cavity will permit ; this can be easily cut from the natural tooth, but

it must be added when a piece of mineral tooth is taken for the facing.

A paste made of kaolin*	..	..	10 parts
White oxide of tin.	..	..	3 „
Quartz or flint	..	..	2 „
Crystallised borax	..	..	1 part

can be applied to the piece of mineral tooth; the shape and size required can be given to it, and it may be then hardened in a small furnace, such as Verrier's,—never in a smaller one,—to a white heat.

I send a few specimens of the three applications.

I think that this way of filling would open a large field for ingenuity and skill, and when the result is successfully attained, of great utility to the public.

The way that I fix them is with a white cement: that of Fletcher is good, also that of Poulson or Eisfelder—in fact, any of these cements will do well. Care must be taken not to make them too thick, and on the other hand to avoid making them too liquid. Practice will determine that point.

The pieces must have as long and large a shank as the cavity will admit, or that we can make safely, or that the state of the tooth well permits.

* The kaolin used was a fine specimen of china clay which was found on analysis to consist of—

Silica	..	..	..	47 parts.
Alumina	..	..	..	40 „
Water	..	..	..	13 „

Most frequently the teeth thus treated have no longer the nerve living, and in these cases we naturally can get a better hold ; the cavity ought to be well under-cut, and prepared with all care, and when these preparations have been taken, a very reasonable and permanent result may be looked for.

I have treated cases like this for several years. I arranged for a lady, whom I still see occasionally, two front incisors in this way sixteen or seventeen years ago, and I have had no occasion to touch them since ; but of course the duration of these pieces would depend upon the same circumstances which influence the duration of all fillings. The advantage which I think they offer in those cases where they are applicable, are great improvements in appearance over other fillings ; the power of reproducing the lost form of the tooth ; the excellent masticating surface they present when applied to broken down molars, especially when the hold of these crowns has been strengthened by one or more screws fixed in the root ; the obviating the divisions between filled teeth which sometimes cause such distressing annoyance to the gums ; and, in comparison to gold contour fillings, the rapidity with which they can be applied and the superiority of their appearance.

The best material for taking the impression which I have found up to the present is wax. I

have tried many other materials, but prefer that ; when that is done, I get the piece prepared in the workroom, and on the next visit, if the tooth or root is in a condition to be filled, I can attach it in a quarter of an hour.

It is an advantage to be able to do away with unsightly amalgam fillings ; not that I pretend that in every instance these pieces could, or should be used, but in those cases—and they are many—where they can be applied with advantage, where the cavity is deep and offers a good hold for the shank, I believe that they would be found useful, durable, and of good appearance.

DISCUSSION.

Mr. WOODHOUSE then handed round a number of specimens sent by Mr. Dunn to illustrate various ways of applying the method. He thought that the uncertain durability of the cements used would be considered by most operators to be an objection to the adoption of Mr. Dunn's procedure.

Mr. COLEMAN said the process which Mr. Dunn had described was one which certainly deserved attention, but it was not new. It had been practised by certain practitioners, more particularly in America, for many years. He remembered having seen some very satisfactory specimens of this kind of work ten years ago; it was of American origin, and had then been done some years. He had even attempted it himself, but found it troublesome work, as the fitting required to be very accurate.

The PRESIDENT said he thought that some of the specimens shown by Mr. Dunn would have been better dealt with by pivoting. At the same time he would say that he thought the old plan of pivoting with natural teeth was greatly preferable to that now adopted of using mineral teeth. The latter never seemed to fit so well, and certainly he never saw such good results from modern work of this description as he had seen in cases which had been operated on forty years ago.

Dr. FIELD said Mr. Dunn's method was certainly not new. He had heard of it years ago, and had practised it himself. Thus he had restored centrals by inserting a piece of porcelain with a pin attached and embedding this in a gold backing, so that only a line of gold showed round the edge of the plate. The result was very satisfactory, very close scrutiny being required to detect the work.

MR. G. PARKINSON remarked that he had pivoted some hundred of roots with natural teeth, and quite agreed with the President that it was impossible to match the work with that which was done with porcelain crowns.

DR. FIELD said he had in several instances extracted teeth which had been pivoted with natural teeth fifteen or twenty years before, and had found them quite perfect, no decay having taken place between the crown and the root.

MR. D. HEPBURN said he had occasion to extract a tooth for an old lady, and found to his surprise that it had been pivoted. On inquiry he learnt that it had been done by his father forty years before, but the union was so perfect that it could scarcely have been detected while the tooth was in the mouth.

MR. NEWLAND PEDLEY read notes of a case in which Hammond's splint had been used with success after surgical division of the lower jaw.

The patient had been admitted into Guy's Hospital, under Mr. Clement Lucas, suffering from epithelioma situated in the sublingual region, and involving the submaxillary lymphatic glands. Division of the lower jaw was necessary in order to get free access to the growth, and Mr. Moon was consulted as to the adaptability of Hammond's splint under these conditions.

The teeth of the lower jaw presented an unbroken arch from the molar region on one side to the other. A zinc cast was obtained, and on this a stout wire loop was fitted, passing behind the molars and fitting accurately to the necks of all the teeth.

Mr. Lucas removed the growth on January 21st, making an incision through the lower lip and dividing the jaw through the socket of the lateral incisor, which was extracted at the time. The tumour having been removed, the Hammond's splint was slipped over the divided jaw and secured with binding wires in the usual way. The lip was then brought together with hare-lip pins.

These cases differed from fractures in two respects; in the

first place the fragments received little support from the surrounding soft structures or from untorn portions of periosteum, as was the case in fractures, nor was their apposition maintained by the interlocking of bony spiculæ along the line of fracture. The result was a tendency to gaping at the lower end of the section, and to obviate this he would suggest that any incision below the jaw should be sewn up as high as the mental prominence before the splint is applied: some support would then be given to the fragments; but it was obviously undesirable that the wound in the lip should be closed before the binding wires had been fixed. He attached great importance to the taking of a model before the operation, upon which a stout wire can be framed and fitted to the teeth with great accuracy. The patient's recovery was somewhat retarded by an attack of erysipelas, but he was now progressing satisfactorily.

The Secretary then read the following communication:—

A Case of Dental Jurisprudence.

BY F. R. LLOYD, Mussoorie, North-West Provinces of India.

MR. PRESIDENT AND GENTLEMEN,

As the subject of Dental Jurisprudence will probably, at no distant date, be included in the dental curriculum, I trust that the following case, which occurred in my own practice, may prove interesting to the members of the Society.

In the year 1861 a Mr. Schlagentweit and his brother were sent out to India for the purpose of making a geological survey of the northern parts of the continent. Mr. A. Schlagentweit had only proceeded as far as Kashgur when he was murdered by a chief of one of the wandering tribes which infest those parts; this at least was the story told by his servant, who escaped to Lahore, bringing a man's head with him, which he declared was that of his master. I happened to be in Lahore at that time, and Mr. Roberts, the Judicial Commissioner, asked me to examine and report on the teeth in this head. There seemed to be great reason for doubting the truth of the servant's assertion, and it was suggested that I might at all events be able to say whether the skull was that of a European or of an Asiatic,

and whether the teeth were those of a man of the deceased's age or not.

The head having been sent me by Mr. T. H. Thornton, the Assistant Commissioner, I wrote asking for a description of Mr. Schlagentweit, and also requesting permission to remove a portion of the dried cuticle from the face, the skin having become like parchment from exposure to the excessively dry, cold atmosphere of Kashgur.

Permission to remove the integument was readily granted, and I was referred to Captain C. W. Hall, Assistant Commissioner, as the person who could give me the best description of Mr. Schlagentweit, who had been Captain Hall's guest in the hills.

I accordingly wrote to Captain Hall, asking him several questions, and received in reply the following information. Mr. Adolphe Schlagentweit was a good-looking man; had dark curly hair, rather square face, small nose, and small regular teeth. He smoked cigars moderately. Captain Hall could not remember whether he had lost a front tooth.

These scanty particulars being all that could be obtained, I next proceeded to make a careful examination of the skull and teeth, and then drew up my report, the principal points of which were as follows: the data being first stated, and then the deductions made from them.

In the upper jaw there were fourteen teeth, the two missing being the second and third molars on the left side ; the sockets of these were partially obliterated ; evidently they had been lost some time, probably two or three years.

All the teeth of the upper jaw, with the exception of the second and third molars on the right side (which were not in perfect apposition with the corresponding teeth in the lower jaw), were worn down to the dentine, and in deep ruts, especially the teeth anterior to the canines ; these latter were so much worn that they resembled bicuspid.

The second and third right upper molars were little worn, their cusps being prominent and well developed.

The teeth were exceedingly dense in structure, and the enamel very thick ; there was not the slightest appearance of caries or of defective development.

The lateral incisors had been worn down to the extent of at least one-fourth of their original length. The right upper central had been so worn as to be completely denuded of enamel on its lingual surface, and presented an even inclined plane. The left upper central was worn on its lingual surface into a deep rut, articulating exactly with the left lower central and lateral.

In the lower jaw there were fifteen teeth, the missing tooth being the right central incisor, the

socket of which was completely absorbed; the width of the vacant space was, however, nearly equal to that of the remaining central, which might mean that the tooth had been lost after the eruption of all the permanent teeth.

The grinding surfaces of the first molars and first and second bicuspid on either side, as well as the cutting edges of the front teeth, were worn down to the dentine; but although the front teeth had lost considerably in the length of their crowns, they were still much above the level of the neighbouring bicuspid and molars.

The second and third molars of the left side were much worn, although their antagonists were not present. Whilst the second and third molars on the right side were not worn, except on their buccal surfaces, these being the only points of contact with the corresponding upper teeth.

The conclusions arrived at from these observations were as follows :—

The fact that in a mouth in which the remaining teeth are so well developed and so firmly implanted, two molar teeth in the upper and an incisor in the lower jaw had been lost by a man who was only twenty-seven years of age at the time he was murdered, is remarkable. If, however, we suppose the person to have been considerably older, the loss of these teeth is much more easily accounted for, since the diminished

vitality of the tooth and periodontium as age advances, together with the partial ossification of the pulp as it recedes before the encroachments made upon its containing cavity from loss of substance on the masticating surface, may, either together or separately, give rise to alveolar abscess, and loosening and ultimate loss of the tooth.

It has been observed that most of the teeth were worn down to the dentine, whilst the second and third molars on the right side, both upper and lower, were not abraded in the least, their cusps, which were not in apposition, being perfect. This afforded a valuable means of comparison as to the amount of substance lost by the other teeth, and when considered in connection with the fact that the structure of the teeth was perfect, the enamel being thick and the dentine well developed and free from any signs of caries, led me to conclude that such considerable loss of substance on their masticating surfaces could not have taken place in the case of any person under forty or forty-five years of age, and in this case I could almost confidently assert that the age was more than that.

I, however, fixed the age at the lowest computation, in consideration of the fact that the natives of India (and I strongly suspected that this was the head of a native of the Tartar type from the high cheek-bones) subsist chiefly on grain of various

sorts, parched and eaten with the husk ; while the flour for making their cakes or *chupattees* is ground between two stones, which throw off a considerable quantity of calcareous powder during the process. This gritty food naturally wears away the grinding surfaces of the teeth much more quickly than is the case with people whose diet consists of ordinary animal and vegetable food. I have had much practice among natives, and had found, especially among Hindoos advanced in years, that their teeth become abraded much in the same way as those of the head I had to examine, whilst they are faultless in structure and development. They are generally also much encrusted with tartar, as were those under examination.

Captain Hall, who was personally acquainted with Mr. Schlagentweit, stated that this gentleman had a very regular set of teeth, whereas the teeth of the head sent to me were very irregular as regards the curves and outlines of their cutting edges.

Although, therefore, I could not give any decided opinion as to whom the head belonged, I considered it was satisfactorily proved that it could not have been the head of a person only twenty-seven years of age, and therefore could not have been the head of Mr. Schlagentweit. The story told by his servant must therefore have been a fabrication, and I think that on the strength

of my report, the authorities would have been justified in arresting Murad, and making stringent inquiries among the frontier tribes. To say the least, the bringing home of the head of another person must have been done with a motive. As it is, the actual fate of his master will remain a mystery.

DISCUSSION.

The PRESIDENT said it had been thought advisable to alter slightly the form of the very interesting communication they had just heard. As first received from Mr. Lloyd all the correspondence was set out in full, and the report contained a number of details respecting the teeth which were important inasmuch as they served to indicate to the authorities to whom the report was addressed, how many points useful for the purpose of identification could be afforded by a careful examination of the teeth. But as these details were not, strictly speaking, relevant to the conclusion arrived at, they had been omitted. He thought the abstract which had been read was quite sufficient to show that Mr. Lloyd had discharged the duty imposed upon him in a manner which must have been highly satisfactory to those who had sought his advice.

DR. FIELD showed a Green's Electric Burring Engine manufactured by the S.S. White Company of Philadelphia. He had used it for some time and had found it work very satisfactorily. The whole of the mechanism was held in the hand, and although the weight might at first sight be considered an objection, he had not found this sufficient to cause any fatigue, or to interfere with the use of the instrument in operations requiring the most delicate manipulation.

The PRESIDENT then announced that at the next meeting, which would take place on April 7th, a paper would be read by Mr. Arthur Underwood on "The Influence of Micro-organisms in the Production of Caries."

The Society then adjourned.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

April 7th, 1884.

J. SMITH TURNER, M.R.C.S. and L.D.S.Eng.,
PRESIDENT, IN THE CHAIR.

The Minutes of the previous meeting having been read and confirmed,

MR. W. H. WILLIAMSON signed the Obligation Book, and was formally admitted a member by the President.

The PRESIDENT announced that the following candidates had been duly nominated, and would be balloted for at a subsequent meeting, viz. :—

MESSRS. ARTHUR BAINES, L.D.S.I., Lichfield House,
Hanley, Staffordshire; and

RICHARD THEODORE STACK, M.D. Dublin,
F.R.C.S.I., D.M.D. Harvard, 10, Westland
Row, Dublin, Professor of Dental Surgery
Royal College of Surgeons of Ireland,
Surgeon to the Dental Hospital of Ireland,
&c.

MR. T. BIRD, M.A. Oxon, M.R.C.S.Eng., 38, Brook Street,
Grosvenor Square, was balloted for and elected an Honorary
Member.

MR. WEISS announced that a copy of a small work, entitled
“Vulcanite and Celluloid,” by S. E. Gilbert, D.D.S., pub-
lished by the S.S. White Company, of Philadelphia, had been
sent as a donation to the Library.

MR. S. J. HUTCHINSON announced that several valuable specimens had lately been added to the Museum by the liberality of Mr. George Parkinson. One was an unusually fine and perfect tusk of the narwhal; the Museum had previously contained only a much mutilated specimen. The other additions being an upper jaw and skull of a walrus, a lower jaw of a bear, and one-half of the lower jaw of a hippopotamus.

He had also received from Mr. Henry Sewill a very large wisdom tooth and two unusually small ones, all three extracted from the mouths of female patients.

The PRESIDENT said there were several Casual Communications entered on the Agenda paper, but as there was an important paper to be read that evening, and he was anxious that plenty of time should be allowed for its discussion, he had arranged with most of the gentlemen to postpone their communications to another meeting. There was, however, one gentleman present who did not very often honour the Society, and who might not be able to attend again; he would therefore call upon Dr. Bellisario, of Sydney, to read his communication.

DR. BELLISARIO said he was much obliged to the President for the opportunity afforded him of bringing before the Society the particulars of a very interesting case which had been under his care in Sydney some months since. It was a case of partial dislocation of the two central and left lateral incisors, with transverse fracture of the right lateral, which was broken across, as nearly as he could judge, about the middle, and the chief point of interest in the case was that this broken lateral united perfectly.

Mr. C., aged twenty-seven, was driving home in a dog-cart late at night, at a rapid pace, when his horse stumbled and fell. He was thrown violently out and struck his face against the stump of a tree, cutting his hand in the endeavour to save himself. He was much bruised and shaken, got home with much difficulty, and sent for his medical attendant, who advised him to see Dr. Bellisario the first thing in the

morning. Dr. Bellisario was, however, unable to visit him before midday (May 3rd, 1883). He found the patient in great pain, his lips and face much swollen, and gums very congested. On making an examination, which he would only submit to after a good deal of difficulty on account of the pain caused by the slightest touch, Dr. Bellisario found the two centrals and left lateral out of position, very loose, and matter issuing from the sockets. The right lateral was fractured transversely; crepitus could be most distinctly felt, and the slightest touch produced the most intense pain, probably from the fractured part when moved impinging on the pulp.

Dr. Bellisario thought it would be worth while to try whether union might not take place, though well aware that such a result is extremely rare. The treatment which he adopted was very simple. He brought the partially dislocated incisors into their proper position, made a gag of gutta-percha to go over two lower molars, and applied it; and also took an impression of the lower jaw. He ordered a strong decoction of poppies to be constantly held in the mouth, as hot as it could be borne, and that only fluid diet should be taken.

When seen late next day, the patient was found to have suffered less pain, and the swelling was slightly reduced. Dr. Bellisario applied a gold plate made to cap the first and second left lower molars; the second bicuspid being absent, the first bicuspid and first molar were utilized for clasps. The gag, which was made so as just to keep the jaws from quite closing, was fitted without difficulty, and produced no more inconvenience than might have been expected. On the 5th the swelling was abating, and there was but little discharge; the incisors kept in position, but there was the same intense pain on touching the fractured tooth. On the 8th the swelling and inflammation were subsiding rapidly, and there was hardly any discharge from the gums. The poppy fomentations were discontinued, and the patient was directed to wash the mouth several times a day with a solution of 4 to 10 parts of phenol sodique. It was explained

to him that the only chance of union taking place in the fractured tooth lay in its not being touched or disturbed, and that therefore the continuance of a soft diet for some time was essential. To this he agreed.

Dr. Bellisario saw him again on the 16th. The swelling had then entirely disappeared; the displaced teeth were in good position, and appeared to be doing well; not so much pain on touching the right lateral. He was told to continue the phenol sodique; the caps had to be added to a little, the mouth having come closer together; the gag was worn constantly, being only removed occasionally for the purpose of cleaning.

Two days later Dr. Bellisario received a letter from the patient, saying that he was obliged to go into the country on urgent business, and might be absent for two or three months, adding that he would be most careful not to use or touch the teeth.

Three months afterwards the patient's wife came to Sydney and called on Dr. Bellisario to say that her husband's teeth were all firm, and that he could use them perfectly. Just before leaving Sydney, Dr. Bellisario saw the patient himself. The three incisors which had been displaced were in position, and quite firm in their sockets; the fractured right lateral was thoroughly united, and if anything more unyielding than the other incisors. There was no tenderness on percussion, and the colour of the teeth was perfectly natural; evidently all the pulps were living.

The interesting feature in the case was the perfect union of the right lateral; when first seen, the parts could be freely moved and crepitus most distinctly felt. Dr. Bellisario added that he considered that nature, rest, and care had had a great deal more to do with the favourable result of the case than he could claim for his own share in the treatment.

MR. S. J. HUTCHINSON said he had then under his care a patient who had met with an accident somewhat similar to that described by Dr. Bellisario, but he was sorry to say that the result of the case was not by any means so satisfactory.

The patient, a lady, fractured her right upper central by a fall. She said she had distinctly felt crepitus, but he (Mr. Hutchinson) had not been able to satisfy himself of this fact. Unfortunately the patient did not apply for advice until some considerable time after the injury, when she was alarmed by the tooth turning black. As the pulp was evidently dead, Mr. Hutchinson opened up the cavity and removed it; the tooth was very painful, and there was a considerable amount of periostitis, which, however, was soon reduced by the application of leeches and fomentations. The tooth was still longer than its fellow, and the ultimate issue of the case must be considered doubtful.

The PRESIDENT then called upon Mr. Arthur Underwood for his paper.

*On the Influence of Micro-organisms in the
Production of Caries.*

By ARTHUR S. UNDERWOOD, M.R.C.S. and L.D.S.Eng.,
(Lecturer on Dental Anatomy and Physiology at the Dental Hospital of
London Medical School, &c.)

MR. PRESIDENT AND GENTLEMEN,

Mr. Milles and myself have so much to lay before you to-night in the form of evidence concerning the part played by micro-organisms in the production of caries, that we feel confident you will excuse us if we go straight to the matter in hand without an unnecessary waste of time in the form of preamble.

It is, however, necessary to state that we only propose to discuss the purely pathological side of the question to-night, and that only so far as the dentine alone is affected.

As we stated in 1881, we still consider that the initial stage, that is, the enamel destruction, is probably little more than a chemical solution of the tissue by an acid or acids; but we are inclined to believe that the greater part of such acids are the result of fermentation, a process which is

entirely dependent upon micro-organic life, as has been amply proved by Pasteur, Lister, and others.

As the result of the decomposition of albumenoids, numerous substances are formed in the mouth—peptones and other similar bodies, fatty acids, acetic, formic, butyric, malic, lactic acid, &c., and in some cases sulphuretted hydrogen and ammonia, are produced in large quantities. This decomposition is directly produced by the vegetation of micro-organisms.

A very simple illustration of this fact is obtained by filling two bottles with neutral saliva and bread, and rendering one aseptic, either by adding carbolic acid or boiling, or any other process of the kind. The micro-organic growth which will take place in the impure one will produce a large quantity of acid; the pure one will remain neutral. The most constant source of an acid reaction in the mouth is undoubtedly micro-organic fermentation.

This is not, however, the main subject of to-day's paper, and therefore we shall content ourselves with this passing allusion to it.

We cannot, however, refrain from expressing our gratification at the careful attention this subject has received from the profession, both here, in America, and on the Continent. Professor Mayr has worked out the chemical aspect of the question with great care and exactness; Mr. Tomes has done much in the direction of the effects of organ-

isms in the soft tissues of the teeth ; Mr. Spence Bate has given us many valuable suggestions in his able and exhaustive summary of dental science at Plymouth last year ; Mr. Sewill has thrown out valuable conjectures upon the remote etiology of caries ; and Dr. Miller, of Berlin, has done an immense amount of microscopical work, contributing a large array of evidence.

We have not been able until now to present our own views in full because many of our experiments required a long time to verify and confirm ; some afforded perplexing and almost contradictory results, requiring a long time to clear up, and involving much repetition ; and we may add, in explanation of the apparent delay, that what takes but little time to write or say often requires months and even years of disappointment and patience to work out.

In the autumn of 1881 we were only justified in speaking with any amount of positiveness upon one point, namely, the actual presence of micro-organisms in carious dentine. This one fact, and the evidence in support of it, formed the body of the paper we ventured to present to the International Congress. Micro-organisms were found in every fragment of carious dentine of which we cut sections, and we had cut immense numbers ; the leptothrix of MM. Leber and Rottenstein was, we found, a superficial growth.

Another fact of scarcely less importance, but one supported by far less evidence, was that the agencies to whose action caries had up till then been attributed by a large majority of scientific opinions, namely, certain acids, were unable to produce any such changes upon teeth exposed to their action alone, although the enamel protection was removed, and the acids employed were those present in the mouth. We had read many allusions to caries produced in teeth out of the mouth by artificial means; we employed the means indicated (whenever they were indicated, which was rarely), with the addition that we did so under absolutely aseptic conditions; we repeated the experiments, and the result of (in some cases) years of exposure was that no change that we could detect took place. Here was a second, but a negative fact.

The third fact obviously required was a positive one: it remained to inoculate dental micro-organisms into the flasks and observe the result. We did so, and the result was change in the exposed dentine, but so slight that we could not succeed in cutting a section; still, at the time of our paper of 1881, we firmly believed that this change, when allowed to become more intense, would prove to be caries. Of this fact we felt bound, however, to speak very cautiously, and for the last two-and-a-half years we have employed

every means in our power to clear it up—with what result we shall endeavour to make plain to you to-night.

We are anxious that you should keep clearly before you four main issues, upon which all the theory which we suggested to you in 1881 depends.

1. That certain forms of micro-organisms, namely, micrococci, rod-shaped and oval bacteria, and short bacilli are invariably present in carious dentine.

2. That these micro-organisms extend into the tissue as far as does the caries.

3. That no agents can be made to produce a change resembling caries in the absence of such micro-organisms, *i.e.*, under aseptic conditions.

4. That under septic conditions a change can be induced which, although we are not prepared to call caries, does in some particulars resemble it; teeth in which this change has been produced we shall submit to you to-night, and also suggest to you why we hesitate to call it caries.

These four points once established upon reasonable evidence, we shall ask you to consider whether we are not justified in deducing from them the conclusion that micro-organisms play an important part in the production of the disease as we see it and are called upon to treat it, and that their active presence is an absolute essential to its production.

We may add incidentally that we never suggested that no other agency assisted in the process, although a recent writer attributes some such absurdity to the advocates of the germ theory. We do not consider ourselves justified in wasting your time over such a digression. The first point to discuss, then, is the constant presence of micro-organisms in carious dentine. Upon this point the evidence submitted to the profession by us in 1881 was very strong. We were then able to state that, since we had succeeded in properly cutting and staining sections, we had always discovered micro-organisms. The appearance was not caused by softening agents, because the teeth were cut fresh and immediately after extraction. The number of sections cut by us between 1879 and 1881 was so great that we were convinced that the phenomenon was constant.

Since then, Mr. Charles Tomes has, we believe, made some investigations which have led him to concur in this constant presence.

Dr. Miller, of Berlin, has cut a very large number of sections of carious dentine, with a result which is completely confirmatory of our assertion that micro-organisms are invariably present. In fact, this point has been confirmed by every careful observer, and may be considered to be completely established.

The second point is one very much more difficult

to decide—the more so because statements have been made upon this point which tend very much to confuse the mind of the reader. It has been stated by Dr. Miller, who has written a very large number of papers upon this and kindred subjects during the last two years, that there is a zone of softened dentine of considerable width, not infected with micro-organisms, separating the normal dentine from that which is so infected; and further, that the outline of this area of softened dentine does not correspond with the outline of the area infected with organisms. We have attempted to verify this observation, but we have arrived at the conclusion that if there be any such zone at all we cannot believe it to be of any considerable depth, as we have not succeeded in finding any softened tissue that did not contain micro-organisms. Having regard, however, to Dr. Miller's reputation as a careful and conscientious explorer, we do not desire to attach too much weight to negative evidence; later on we shall suggest some weighty positive evidence on this point. With regard to the outline, we have invariably found the outline of the changed tissue to correspond with that occupied by micro-organisms, and we feel less hesitation in doubting this latter statement of Dr. Miller because he claims to be able to compare these outlines with the naked eye, unaided by any instrument; we think that this is too rough a test

for objects whose greatest measurement does not exceed the $\frac{1}{10000}$ of an inch.

There is no doubt that it is easy to establish a line of demarcation with the aid of a sharp instrument between tissue that you can easily prick and that which is quite hard : this line no doubt corresponds very nearly to the edge of the disease ; we have also come to the conclusion that it corresponds very nearly to the edge of the micro-organic invasion, that is, we have cut sections as near as we could to the healthy tissue, and have found them infected. We do not, however, attach so much weight to this fact as to the following experiment, which we think must be allowed to be absolutely conclusive.

Before we can explain its full weight we must enter into a few details of the method we employ to grow and cultivate special germs. We used to make a meat infusion, boil it, introduce it with antiseptic precautions into aseptic test tubes, and seal the tube with wool. If the fluid remained clear we knew it was pure ; if it became turbid within a day or two we knew our precautions had not been complete, and some germs had been introduced accidentally, and the tube was of course useless. If we wished to grow a special germ we rubbed a purified probe against the infected spot, and introduced it into the fluid, replaced the wool cap, and the ensuing turbidity denoted the growth

of the germ. The objection to this plan was that the turbidity spread through the entire fluid, and if we had, despite our precautions, introduced any other organisms besides those we specially intended to introduce, they all became inextricably mixed in the ensuing putrefaction. To obviate this we adopted Koch's plan of adding gelatine, and instead of a pure fluid making a pure jelly ; when this was inoculated in a particular spot the growth was confined to that spot, and if anything else dropped on the surface of the jelly it grew there quite separate. Under these circumstances we noticed that different forms of germ grew in quite different ways, some, for instance, forming a white ball, others a mass of spiculæ, others wavy lines ; these peculiarities of growth could be easily reproduced in other flasks by a second inoculation, until we found it quite easy to separate each variety and grow it by itself without any extraneous growth to confuse the result. We have brought down some flasks with growth going on to show you to-night. Well, we proceeded to inoculate flasks with those deepest portions of softened tissue which formed the most outlying layer of changed dentine, and we found that from these portions a growth of organisms proceeded, proving beyond doubt that organisms were contained in the pieces inoculated. This is not a doubtful experiment ; it absolutely demonstrates

that the deepest portions of the softened tissue contained organisms, and that if there exist any zone of alteration beyond them it is so microscopically narrow that we have not been able to detach a fragment of it.

We do not, however, deny that there is a great probability that the advance guard of micro-organisms may be surrounded, and, *to a microscopical extent only*, preceded by a softening, the result of the action of those acids which they themselves produce,—we shall be able to show that they do generate acids capable of softening dentine, and therefore we should expect to find this effect slightly in advance of their presence,—but this is hypothesis merely. We would further add that the transition from very carious tissue to that which seems quite healthy to the eye and the touch is, in the greater number of cases, more sudden than is generally supposed, and allows but little space for this non-infected zone ; to convince one-self of this it is only necessary to split a number of carious teeth and prick the surfaces. One more fact should be borne in mind in this connection, namely, that healthy dentine softened by a weak acid does not look different under the microscope from healthy dentine cut fresh, and it is therefore impossible to detect the softening microscopically ; the tubes are not larger, nor are they irregular, as is the case in carious dentine—in fact, the existence of such

a softened and uninfected zone separating the infected from the non-infected dentine is a matter so difficult to demonstrate that we do not think much value is to be attached to it.

We now come to the third point, viz., that it is not possible to produce caries or anything resembling it, by subjecting teeth to the action of acid fluids in flasks out of the mouth, provided the flasks be kept in a strictly aseptic condition. We do not think this point has ever been disputed, and we feel in position to state that the evidence upon which it rests is incontrovertible; but before discussing it, and the point that follows it, we think it will not be a waste of time to explain what we mean by a change resembling caries. We mean a change by which the tissue affected is made distinguishable from that which is normal to the naked eye and touch or under the microscope. To the naked eye it must become discoloured,—we only mean changed in colour, and not necessarily brown; the surface loses its polish, or, if moist, the affected part must be separable from the healthy with an instrument; to the touch it must become softer; under the microscope the channels must become dilated at the expense of the matrix. In 1881 we exhibited several flasks in which infusions of meat and saliva containing malic, butyric, and other acids had been allowed to act upon exposed dentine for periods varying from one to three years;

the teeth were liable to caries because they had suffered already from it; healthy portions were denuded of enamel and partially protected by wax, a certain part being left exposed, with no perceptible result whatever. Of course a strong acid, or a large amount of acid, would decalcify the tooth, but this does not resemble carious change.

These experiments were sufficiently numerous and conclusive to warrant us in passing on to the fourth point of this investigation, and this will detain us longer than any of the others, as it is in this direction that we have experienced the greatest difficulty and the most perplexing results.

We were so fully alive to the overwhelming difficulties attending any attempt to reproduce out of the mouth the complicated conditions existing therein, that we should have felt anything but sanguine but for a curious accident that encouraged us to proceed in this direction. We will therefore commence by telling you the particulars of this accident.

At the Congress in August, 1881, we exhibited, among other flasks, a series intended to illustrate the fact that no change resembling caries could be induced upon the surfaces of teeth under aseptic conditions. These flasks all contained an infusion of meat and saliva with malic and butyric acid and teeth susceptible of caries, the surfaces ground down to expose the dentine, part of the exposed

surface being protected with wax, so that any loss of substance could be at once detected in the exposed part. Now these flasks, which were labelled i, iii, iv, v, vi, had remained perfectly pure from the time they were put up, June, 1880, till the Congress, August, 1881, that is, fourteen months, and no visible change had taken place in the exposed surfaces. In taking them home in a bag, flasks i, iv, and v fell down, allowing the fluid to come in contact with the cap covering the flasks; iii and vi remained upright.

In the course of a few days, flasks i, iv, and v, which had tumbled down, became turbid; iii and vi remained, of course, pure. By the 5th of December, 1881, iii and vi were to all appearances, as before, unaltered; but the teeth in i, iv, and v were already discoloured brown; moreover, the discoloured parts were on the surfaces slightly softened, and although the change was so shallow that we could not obtain a good thin section of it, we could see that the tubes were enlarged and contained a material that stained readily, which, owing to the thickness of the section, we could not, unfortunately, identify. Now, whatever this change was, it was manifestly dependent upon the introduction of organisms; nothing else was introduced. Fourteen months' immersion in the fluid when aseptic failed to change the teeth at all; four months in the same fluid plus germs

produced a change ; the same additional four months in the sister flasks produced no change at all ;—this seemed an important addition to the facts in our possession at the Congress. The next stage was less satisfactory : the change did not seem to progress ; do what we would, we could not produce a considerable change. We conceived that this might arise from the fact that several important conditions favourable to the activity of the germs in the mouth were absent in the flask. First, the temperature of the body ; second, opportunities for lodgment ; third, constant renewal ; fourth, unlimited and varied pabulum ; we therefore contrived a very elaborate experiment in which we proposed to assemble all these conditions, and as many more as we could think of. We erected a large incubator, which we kept continually at the temperature of the human mouth ; it was divided into an upper and a lower story, which communicated by an aperture. In the upper story was a small bath with a tiny tap contrived to drip drop by drop through the aperture into a second bath in the chamber below ; this again dripped into a receiver, the fluid being thus kept in constant circulation through the middle bath. In this middle bath were placed some teeth set side by side as in nature, the roots being implanted in a block of hippopotamus ivory, and weak points created in the interstitial parts

with the burring engine, the size of the burr being kept to test any enlargement of the holes, and some others implanted in wax. The upper bath was then filled with saliva, milk, bread, decaying teeth, meat, &c. ; while some fragments of the latter were inserted about the teeth in the middle bath. The lowest receptacle was periodically emptied, while the top one was periodically fed. Without troubling you with more details, we thus contrived to assemble the proper temperature, the pabulum movement, and the normal disposition of the teeth. Now six months of this highly unsavoury experiment produced scarcely any perceptible change, except that all the tissues became black, the holes drilled in the blocks and in the teeth were the same size, and their edges were not a bit softened. The putridity of the baths was however so offensive, that it was with some relief that we decided to abandon this particular experiment. We saw that some great essential condition was absent, and though a longer period might doubtless have produced slight changes, my health and appetite suffered from the constant exposure to all these putrid smells, and we agreed to stop the incubator ; but this experiment, though apparently a failure, led us to what we conceive to be the true solution of the difficulty. So far we had decided only that some essential factor had been omitted.

The next experiment we shall describe is a repetition of one described by Dr. Miller, with this extension, that it has been carried out under septic and aseptic conditions. Two 8-oz bottles were half filled with saliva; to this was added bread in both cases, and in one carbolic acid; into these were introduced fragments of healthy teeth extracted for regulation and split. The saliva was the same,—*i.e.*, from the same mouth,—and taken at the same time, the bread from the same piece, the teeth were halves of the same tooth; both fluids were neutral. The bottle not containing carbolic speedily became the scene of an active growth of micro-organisms, for the greater part micrococci; a thick felt of this growth formed at the surface of the fluid. At the end of three months the surfaces of the teeth in the impure flask had become softened, but not discoloured: the surface of those in the pure flask was unaltered, the fluid in the pure flask was neutral, that in the impure one strongly acid. Thus in the impure flask acids were generated as well as germs, or, as we think seems more rationally to express it, by the germs. The teeth from these fluids are here for your inspection. Lastly, a number of teeth are here for your inspection in which a change has certainly taken place after a long immersion in septic fluids.

It is plain, then, that whereas in the absence of germs no change takes place that could be

supposed to be caries, and that in the presence of germs a change does take place, which, although it would render our views more cut and dried to call caries, we are bound to confess is a very weak caries if it be caries at all, and further, remembering that unmistakable caries does affect natural teeth on artificial dentures which have no connection with the vascular system, we are led to inquire whether organisms, that are undoubtedly the prime factors in the production of other diseases, afford us any analogy of a loss of power when placed in strange conditions. The answer to this inquiry is very plain and direct, and completely in the affirmative.

Pasteur, Naegali, and other equally reliable authorities, have discovered that special organisms alter their character when grown under unusual conditions. Even though they continue to grow and reproduce their species, their special properties weaken and die out in the unnatural surroundings. Thus, to take a couple of typical instances, Pasteur, by growing bacillus anthracis at a peculiar temperature, "attenuated" the organism to such an extent that he was able to vaccinate animals with it—that is, he rendered this special bacillus, which, in its normal condition, would, if inoculated into an animal, produce anthrax, practically innocuous by changing its surrounding conditions. Again, Naegali has been able so to modify the

properties of a lactic acid producing bacterium that it produced an ammoniacal fermentation. Lastly, certain pathogenic bacteria require a special soil in which to grow and a special temperature, otherwise the growth ceases altogether. Moreover, the presence of a number of extraneous organisms does in some cases hinder the active growth of others. A similar difficulty has attended the attempt to grow the organisms of gonorrhoeal ophthalmia, and such instances may be almost indefinitely multiplied; the conclusion is, however, pretty plain, namely, that special organisms require special surroundings to display their special activity, and we are inclined to think that in the case of the micro-organism of caries a living mucous membrane is one of those conditions.

In view of these facts we feel ourselves justified in claiming to have established as a permanent addition to dental pathology the fact that micro-organisms of a special form do play an important part,—nay, more, that they are an essential factor in the production of caries. We think many of these experiments show that these organisms do much of the work—at any rate, as far as the removal of the lime salts goes—by the aid of an acid which they produce. We feel convinced that the process, to be effective, must be carried on in a living mouth, probably because that is the only situation in which the

special germs are really active. Analogy seems to warrant this deduction ; but before concluding we wish to impress upon the meeting, and through the meeting upon all who take an interest in the matter, that all we claim for the germs is, that without them and their products the process could not go on at all. The essential element that was not present in our artificial experiments is present in the mouth ; it is possible, and we consider, from the analogies quoted above, *probable*, that this important element is the living buccal mucous membrane as a scene of operations, and the constant succession of the proper germs. Enough has, however, been laid before you to induce us to hope that this Society will endorse the statement made by us in the August of 1881, and repeated more fully now, that micro-organisms play an important part in the production of caries, and that the dental pathology of the future must include them among the most powerful factors in the production of this disease.

We have only, in conclusion, to thank you, Gentlemen, for your kind attention, and to leave the question in your hands for discussion.

DISCUSSION.

MR. W. J. MILLES said he had only a few words to add bearing on the subject of the pure cultivation of micro-organisms. By "pure cultivation" we mean the inoculation of the contents of a purified flask with a special form of micro-organism. The flasks contain solidified blood serum purified after Koch's method by heating it to a certain temperature. Certain precautions are taken, such as purifying the needle by passing it through the flame of a spirit lamp, &c. The cotton-wool cap is then removed from the flask, and the surface of the fibrine is inoculated with a small portion of carious dentine taken up on the point of the needle. From the point thus inoculated the organisms grow, and in some instances we have obtained pure cultivations, that is, we were able to separate the species, and to ascertain that these organisms breed true. For instance, we inoculate a micrococcus into a sterilised flask, and we find that it reproduces the same species; and if we inoculate a series of flasks from this one, we get the same result. By this means we were able to separate certain of these micro-organisms,—micrococci, bacteria, and certain spirilli and bacilli.

Having thus separated the organisms, we tried to advance a step further. We hoped to be able to discover the special form of organism which produces caries, but unfortunately with negative results. Having allowed the organisms to grow to a considerable extent in the flasks,—here is one which you see has become absolutely opaque with organisms,—we boiled a healthy tooth for a certain time, and then dropped it into a tube containing some special form of organisms,—say, one containing nothing but micrococci,—and we left it there for several weeks, and, in some cases, months, exposed to the action of the organisms, maintaining during the time a moderate elevation of temperature, but, as I have said,

no change whatever occurred. The probable explanation is that which Mr. Underwood has given, viz., that some of the conditions necessary for the production of caries, which exist in the mouth, were absent from our experiments. I have no further remarks to make at present, but if any one likes to ask any questions later as to the incubation of these flasks, or any of our other experiments, I shall be very pleased to give any information I can.

The PRESIDENT remarked that micro-organisms seemed to be assuming an important position, not only in dental but also in general pathology. As regarded the part they played in the production of caries, the inquiry seemed to have a certain fascination about it which he had no doubt had been felt by many of the members present, and he hoped that some of them would favour the meeting with an explanation of their views on this important question.

MR. HENRY SEWILL said he must in the first place assure Mr. Arthur Underwood of the high opinion he had of the work which had been done by him and his colleague. He regretted to say that he did not himself belong to the remnant of the Society which could lay any claim to a scientific position; but so long as the Society possessed a remnant like Mr. Underwood and others, whose names they were all proud of, its reputation would continue high.

He thought that there were strong *à priori* grounds for acquiescing in the correctness of the views which Mr. Underwood had put forth. They explained one or two points which were previously not very clear, viz., why the dentine was more rapidly destroyed than the enamel, owing to the organisms multiplying in the tubes of the dentine. It was evident also that if Mr. Underwood's views were correct, they effectually disposed of all the theories based upon inflammatory processes in the dentine, the existence of vital force, and other hypotheses which he believed to be entirely false and misleading. He had himself long held and affirmed that dental caries consisted essentially of disintegration of the enamel and dentine due entirely to the action of external

agents, that the enamel and dentine were perfectly passive during the process, and manifested no pathological action, and no so-called vital phenomena. He thought that the truth of this statement was amply proved, first, by the fact that from our knowledge of the anatomy of enamel and dentine it was impossible to conceive that enamel, and scarcely less possible to conceive that dentine, could be the seat of anything like pathological action. Secondly, there was the fact that caries might occur in natural teeth inserted in artificial dentures, and even in hippopotamus ivory when worn in the mouth.

The *predisposing* causes of caries were, first, innate structural defects in the enamel and dentine; secondly, overcrowding and irregularity, which acted by favouring the lodgment of food between the teeth for prolonged periods, and the formation of the products of decomposition; and, lastly, vitiated secretions in the mouth. The *exciting* cause of caries was acid in some form or other.

The authors of the paper had shown clearly that the disintegration which takes place in a carious cavity could not go on without the presence of organisms, but though it was no doubt important to ascertain the nature of the minute changes which took place in the tissues whilst undergoing disintegration, he did not regard these as of supreme importance. The important point was to disprove the various false views of the nature of caries which had been put forth from time to time. To these Mr. Underwood's investigations had helped to give a finishing blow, though he considered they could be clearly disproved without their aid.

DR. ST. GEORGE ELLIOTT said that, being tolerably familiar with the writings of Dr. Miller, he should like to point out the chief discrepancies between the facts therein spoken of, and those which they had heard brought forward that evening. There was, in the first place, the zone of softened uninfected dentine which Dr. Miller described as existing between the part invaded by micro-organisms and the limit of the hard portion of the dentine. He thought this zone

had been originally noticed by Mr. Tomes. Mr. Underwood denied its existence, and had been very explicit on that point. To outsiders it became simply a question as to which was right, and probably a few additional observations would decide the point.

Then Dr. Miller stated positively that he could produce artificially, under septic conditions, out of the mouth, caries so closely resembling that which occurs in the mouth, that he had submitted a large number of slides, some bearing the artificial and others the natural product, to microscopists in different parts of the world, and defied them to tell the one from the other. Mr. Underwood had said that he had repeated these experiments, and had failed to produce caries artificially. Here again came the question, Who was right? A little further experimenting would probably elucidate this matter also.

Again, Dr. Miller said that the several forms of micro-organisms met with in carious dentine,—the micrococci, bacilli, &c.,—were only different forms of the same fungus. Mr. Milles stated positively that they were separate and distinct varieties. That was also a matter which outsiders like himself would like to see elucidated and settled by independent testimony.

MR. C. S. TOMES said the questions brought before the Society in Mr. Underwood's paper, even though the lines of the paper were strictly adhered to, would require for their full discussion a much greater amount of time than was usually allotted to such discussions at the Society's meetings. There was, however, one point referred to by Mr. Underwood which he thought was worthy of comment, if only for the sake of emphasizing and calling attention to it, viz., the fact that many of these micro-organisms, when cultivated under conditions which they do not like, become stunted, as it were; just as was the case with a plant when grown under unfavourable conditions. And he thought it very probable indeed that the failure of Messrs. Underwood and Milles' artificial caries experiments was due to this cause, to their being unable to

give the micro-organisms just the conditions which suited them. In conversation with Mr. Underwood he had repeatedly told him that he should be extremely surprised if he ever did succeed in producing caries out of the mouth, seeing that the conditions under which it occurred in the mouth were so manifold.

He did not, however, think that Mr. Underwood was so near the mark when he attributed this activity in the growth of the organisms to the direct influence of contact with the buccal mucous membrane. It seemed to him that if we are to assign to these organisms the important share in the production of caries which many recent investigators were inclined to give them, it was quite essential that they should be able to reproduce themselves for a great number of generations without contact with any mucous membrane. To take the case of a small crown cavity entered by a narrow fissure in the enamel: if organisms could not grow and reproduce themselves for an almost infinite number of generations in such a crevice, caries would not go on in such a situation as readily as we know it does. Moreover, there were a dozen other conditions besides contact with mucous membrane to which the failure might be ascribed with at least equal probability. For instance, there was an amount of oxygenation in the mouth which it would be almost impossible to reproduce in a flask experiment,—currents of air were being constantly wafted backwards and forwards over a moist surface. We know also that there is a considerable consumption of oxygen in other somewhat similar processes, and that bacteria like oxygen, and do not grow very well without it. But he was not going to pledge himself to a hypothesis; he only wished to point this out as one of several other conditions which existed in the mouth, but which were not present in such experiments as Mr. Underwood had described, and that therefore the failure to produce caries at will in a flask or incubator experiment appeared to him to invalidate very little or not at all, any inference which might otherwise be drawn as to the action of organisms in the real disease.

MR. COLEMAN said he thought all present must feel deeply indebted to Messrs. Underwood and Milles for their very important researches. These certainly explained to a great extent what might be termed the *progress* of caries, if not its actual cause; and they would be of still greater value to the dental profession should it be found possible to deduce from them some more perfect method of prevention and cure.

At the same time it appeared to him that there were certain points which had been rather overlooked. For instance, that in certain conditions which one would suppose would be most favourable for the development of the disease, it did not occur. He referred to the state of things met with in some of those dirty-mouthed people occasionally met with, who even at the distance of some yards were most unpleasant neighbours. Yet, whilst their gums might be highly congested, the interstices of their teeth loaded with decomposing organic matter, and everything apparently most favourable for the production and increase of micro-organisms, still the teeth would be free from any appearance of caries. On the other hand, persons were met with of a different constitution who took the most scrupulous care of their teeth, by carefully cleansing them after every meal, the use of antiseptic tooth powders, &c., and yet we may find in such cases a considerable amount of rapidly progressing decay. It must therefore be admitted that the amount of caries cannot always be in proportion to the quantity of micro-organisms present.

There was another fact which he thought should be mentioned, and which he thought could not be fully accounted for by Mr. Underwood's theory, and that was that all the exanthemata, more especially scarlet fever, produced a change in the teeth which rendered them far more liable to the action of caries. It was found that in such cases the teeth decayed very rapidly. It might possibly be hereafter discovered that these diseases produce the special organisms which favour the production of caries, but he thought it was more reasonable to look for some change in the tooth itself. One might be laughed at for speaking of "vital force," but he thought few would be inclined to deny that there existed in the living

frame a force which protected it from the ordinary action of oxygen, moisture, and those other agencies which tend to break up complex nitrogenous compounds. And that, under the circumstances just mentioned, whilst the active force from without might be increased, there was also a diminution of that peculiar resistance to change which should exist within the organ.

MR. CHARTERS WHITE said he had as yet no practical acquaintance with the subject of the paper, but he had been greatly interested by it, and felt strongly inclined to make a few observations for himself. He should, therefore, be glad if Mr. Underwood would inform him what power was the best for the examination of these bacteria; also if they had any particular method to recommend for cutting sections, whether the teeth were decalcified or how they were treated. He thought that probably there were others besides himself who, if they knew how these beautiful preparations were obtained, would be encouraged to take up the subject, and without wishing to throw any doubt on the results obtained by Messrs. Underwood and Milles, he thought that the more investigators there were the better.

MR. CUNNINGHAM (Cambridge) said he had listened to the paper with great interest, and he gathered that Mr. Underwood had made no endeavour to reproduce, except in one or two instances, the experiments of Dr. Miller. He thought it would be very interesting if this could be done, so as to ascertain if a series of similar observations confirmed Dr. Miller or not. He quite agreed with a previous speaker, that what was now wanted was a few independent observers to check the results already obtained.

MR. F. J. BENNETT said there could be no doubt that Dr. Miller and Messrs. Underwood and Milles had between them done a great deal towards clearing up the connection of micrococci and bacteria with dental caries. It had been said that their investigations did not entirely explain all the facts connected with this disease, but he thought that the varying strength of the teeth had not been sufficiently taken

into account. He thought that a great deal depended on this : that it in great measure accounted for the fact that certain races of mankind did not suffer from caries, not because there were not bacteria in their mouths, and not because there was not a sufficient amount of acid present, but because the teeth in such cases were made of almost a different material, a much stronger material and more perfectly formed.

In the next place he wished to remind Mr. Underwood what a grand fortune would be open to him if he could find out any organism of a lower cultivation, which, if inoculated in the way Pasteur had done, would in any way check or modify the action of the other organisms. This might seem a very absurd suggestion to make, still something similar had been done in other cases, and if by any means this could be effected with the organisms of caries, it would be a very grand thing indeed.

MR. ARTHUR UNDERWOOD, being called upon by the President to reply, said: Mr. President and Gentlemen, I have to thank you for the tone which the discussion has taken, and I have also to thank you—which is not always the case in such discussions—for some excellent suggestions.

With regard to the individual speakers, I am really not called upon to answer Mr. Sewill, because I believe he agrees with me upon the point which I put forward, viz., as to the constant presence of these micro-organisms. If I may emphasize what I said at the beginning, we do not for one moment assert that they do the whole of the business, but we do assert that they play an important part, and that as regards the fact of their being present in the teeth we were the first to point that out to you in 1881.

Dr. Elliott seemed to imply that with regard to the zone of softened non-infected dentine spoken of by Dr. Miller; with regard to the production of decay in flasks; and with regard to micrococci and bacteria being different forms of the same fungi, we simply meet assertion by assertion. Now with regard to every one of these points we have not made a

single assertion which is not based upon certain definite facts which we have stated in detail. With regard to the "zone," we say that, as near as we could get to the tissue which is quite hard,—and we conducted the experiment carefully and without prejudice, for we had no particular desire to find bacteria there,—we found evidence of the presence of bacteria. We picked away as much as we could of the disorganised dentine, and then, from the deepest portion of what remained, we inoculated a purified flask. In the flasks thus inoculated we got a growth of micro-organisms, and we argue from this that there must have been micro-organisms in the matter thus introduced, otherwise no such result would have followed. It cannot, therefore, be said that we have merely put forward an assertion with regard to this zone.

With regard to the artificial production of decay under septic conditions, we should be only too delighted if we could succeed in doing what Dr. Miller appears to have done; in fact, so delighted were we when we read, about a year ago, in one of Dr. Miller's papers, of what he had done that we wrote to congratulate him and to ask him exactly how he had done it. He wrote back a very kind letter, giving us the information we had asked for, and we proceeded to repeat the experiments as nearly as we could from his description, but we could not get the same result. We placed the teeth in the mixture of saliva and bread, and did exactly as Dr. Miller directed us; but though some softening took place it was certainly not caries. If any one would like to investigate this point for himself we have the teeth so softened here for examination.

Then, with regard to these various organisms being only different forms or stages of growth of the same fungus, we have given you definite and detailed facts. We have implanted leptothrix, micrococcus, bacillus, and the oval and rod-shaped bacteria, each by itself, in little flasks, and they have grown and continued to grow for a very long time, and, as Mr. Milles has expressed it, they have always "bred true." The bacillus has never gone on to produce leptothrix,

nor have the micrococci produced bacteria, and therefore we feel justified in asserting that these organisms are not the same thing in different stages of growth, else we should have succeeded in tracing some of these changes. So that here again we put forward a fact, and not merely an insertion.

Mr. Tomes, as usual, picked out a weak point in our paper, and one which I wish we had omitted, since it does not in the slightest degree affect the main question. But when we said that the living buccal mucous membrane was essential for the production of caries, we meant something more than the mucous membrane by itself. We meant the mucous membrane plus its secretions; we meant the conditions under which you would expect organisms to live happily together inside of or on a mucous membrane; in short, it was a short way of expressing the conditions present in the mouth. We are perfectly agreed as to its being a very unlikely thing that caries should be produced artificially out of the mouth, because there are so many conditions to reassemble which are so very difficult to reassemble. We did not suppose for a moment that we could produce all the conditions under which caries flourishes, but we tried to reproduce as many as possible, and I think we succeeded in assembling a considerable number of them.

I think Mr. Coleman is perfectly correct in saying that it is at first sight a very curious thing that cases are not unfrequently met with in which you can trace the accession of caries in an individual to an attack of one of the exanthemata, or to pregnancy; and no doubt it would safely be concluded that the fever or the pregnancy had something to do with the caries. But you may also safely conclude that it did not produce it, else caries would be a necessary consequence of pregnancy or a fever, which we know is not the case. But we know that both in pregnancy and in the exanthemata, the mucous membrane, and the mouth generally, is brought into a condition in which very unusual secretions are produced, and thus we may have acid secretions which weaken the enamel, and thus favour the entrance

of the micro-organisms, for we all agree that without some weakening of the enamel by acid nothing in the shape of caries could go on at all. It may be also that some of these diseases do directly affect the teeth; we know that they affect the skin and the hair, and in fact all the epithelial structures, and thus they may possibly affect the teeth. So also with regard to persons with offensive mouths who do not happen to suffer from caries. No doubt in such cases the enamel is perfect, and if the enamel is perfect no harm will result, no matter how many micrococci there may be in the mouth. There is no doubt that we all of us have abundance of micrococci in our mouths, and therefore it might be said that we ought all to have caries. But these are side issues. The main point is that the micro-organisms are invariably present in caries, and that they do effect the chief part of the change.

I must ask Mr. Milles to reply to Mr. White's very pertinent questions; they are questions which we are very pleased to answer.

In reply to Dr. Cunningham we may say that we do not look upon Dr. Miller at all in the light of an opponent, but rather as a fellow investigator. We have arrived at pretty nearly the same points. Dr. Miller thinks there is a certain amount of tissue affected beyond that invaded by the micro-organisms. I do not think so, nor does Mr. Milles, but we do not consider this a very important difference; on the other hand, we consider the presence of the micro-organisms a very important factor, and so does Dr. Miller.

With regard to Mr. F. J. Bennett's suggestion, it is no doubt a good idea, but I fear it is rather too experimental at present. I fear also that the amount of distrust now existing in the mind of the profession and of the public, when the subject of micrococci and bacteria is approached, is so great, that it would be difficult to persuade any one to be the subject of any such investigations; they would probably prefer rather to bear the micrococci that they have, than fly to others that they know not of.

In conclusion, I should like briefly to sum up what we have

said. The micro-organisms are there; there is no doubt about that. The micro-organisms which are present can produce, and do produce, an acid. An acid and micro-organisms together can and do produce caries. Whether this can be imitated out of the mouth really does not much matter. It would be very satisfactory if one could produce caries out of the mouth, but this is not really necessary to establish our point.

One other thing which I should like to have no mistake about is this, that the principal portion of the acid in the mouth is produced by fermentation, and that those acids which are not so produced, and which are evanescent, are not in any way blameable with caries. The food gets lodged between the teeth, acid is formed, the enamel is destroyed, the micro-organisms invade the dentine, and the rest follows.

We have tried to cut this paper as short as we could, but, omitting the hasty expression about the mucous membrane, which was inserted inadvertently, and which gave Mr. Tomes a handle, I think we have stated our views clearly, and we are quite prepared to defend them.

I will now leave Mr. Milles to reply to Mr. White's question, and have only to add that we shall be very pleased to show you our specimens afterwards.

MR. MILLES: In reply to Mr. Charters White I may say that simply to demonstrate the presence of micro-organisms an ordinary $\frac{1}{3}$ or $\frac{1}{4}$ inch objective is sufficient; but for more careful examination, as, for instance, for the drawing of these diagrams, we have used principally a $\frac{1}{12}$ -inch oil immersion lens by Powell & Lealand, with an angle of aperture of 1.43° . We have also occasionally made use of a $\frac{1}{25}$ -inch by the same makers, borrowed from Mr. Nelson.

As to the method of obtaining our sections. The teeth are softened, sometimes in chromic acid, sometimes in hydrochloric, and sometimes in mixtures of the two. We have tried various other methods with varying success, but chromic and hydrochloric acids seem to do best. When softened by the acids we put the tooth in a solution of gum, or gum and syrup,

and use Swift's Freezing Microtome for making the sections. In some instances we have made sections right through the tooth, but it is not really necessary to make such large ones; you can generally get thinner sections if you only take part of the tooth where the caries exists, with a small portion of the healthy tissue beyond. Finally, the section is stained with some aniline dye,—gentian violet or methyl violet,—in the usual manner.

A vote of thanks to Dr. Bellisario and to Messrs. Underwood and Milles having been proposed and carried with much applause, the President announced that at the next meeting, on May 5th, a paper would be read by M. E. G. Betts, entitled, "Observations on the Teeth of certain Rodents," and the Society then adjourned.

After the meeting MR. LLOYD WILLIAMS exhibited an electric mallet, differing from that generally used in that the current was made and broken, and the strength of the blows regulated, by pressing on or releasing a spring pedal lever, instead of by means of the usual arrangement in the hand piece.

MESSRS. UNDERWOOD and MILLES also exhibited their apparatus and microscopical specimens, and explained the details of their experiment.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

May 5th, 1884.

J. SMITH TURNER, M.R.C.S. and L.D.S.Eng.,
PRESIDENT, IN THE CHAIR.

The Minutes of the last meeting having been read and confirmed,

The PRESIDENT announced that the following gentlemen had been duly nominated as candidates for election, and would be balloted for at a subsequent meeting, viz.:—

MESSRS. STEPHEN MUNDELL, L.D.S.Eng., Castley, near
Harewood, Leeds; and
ARTHUR PALLANT, L.D.S.I., Maidenhead.

The following candidates were then balloted for and elected members of the Society, viz.:—

MESSRS. EDWARD BARTLETT, M.R.C.S., L.D.S.Eng., 38,
Connaugh Square, Hyde Park, as a Resident
Member, and

WILLIAM FORESTER, L.D.S.Glas., Clyde Villa,
Temple Street, Barford, Stoke-on-Trent, and
JOHN H. MCCALL, L.D.S.Eng., The Spa,
Leicester, as Non-resident Members.

MR. S. J. HUTCHINSON showed a model of an upper jaw sent as a contribution to the Museum by Mr. George Wilson, of Hull. It showed that the patient was possessed of two supernumerary teeth, one occupying the place of the right upper central incisor and the other behind it.

MR. AUTHUR UNDERWOOD handed round a tooth which had belonged to Ba Anta, a daughter of Rameses II, or the Great, who reigned about 1550 B.C. Ba Anta is supposed by Egyptian scholars to have been the daughter of Pharaoh who found and adopted Moses. The tomb in which she was buried was broken open and plundered by the Arabs some years ago; they even unrolled and then burnt the mummy, but the lower jaw escaped destruction and was found in the tomb, which was near Thebes. The jaw came into the possession of Mr. H. R. Graham, who presented this tooth to the Society.

MR. STORER BENNETT showed a specimen which had been lent for the purpose by Mr. Balkwill, of Plymouth, illustrating in a very remarkable manner the serious results which might happen to rodents from the continuous growth of their characteristic teeth when from any cause their normal antagonism was lost. It was the skull of an old English black rat, now nearly extinct. Its two lower incisors had been deflected to the left, the two upper to the right, so that they did not meet in the usual way. The right upper tooth had described one complete circle and three-fourths of another, and being well inclined outwards, it had not encountered any obstacle. The left upper tooth, after describing a circle, had encountered the right upper jaw, which it had penetrated to the depth of one-third of an inch. The left lower tooth had been broken off, whilst the right lower tooth had penetrated the left upper jaw and the parts above, and its point projected a quarter of an inch above the highest point of the skull. It had also ulcerated through the lip in two places, a bridge of the upper lip covering a portion of the tooth. The animal was caught in a flour mill, and as the lower jaw was quite fixed, it could only be supposed that it had sustained life by sucking the flour. The well-known law that parts which were not used became wasted was also illustrated by this specimen; for whilst the left side of the lower jaw, on which some movement was possible, was fairly strong, the right side, which was fixed, was much less developed.

Mr. Bennett added that although several specimens illustrating the results of this accident were to be found in the Society's Museum, and in that of the Royal College of Surgeons, he had not been able to find in either of these collections so remarkable an instance as that which he then showed. He exhibited also the skull of a rabbit, lent by Mr. Boyd Wallis, in which the left lower incisor had grown to a great length, owing to the same cause.

The PRESIDENT remarked that he believed such accidents were more common amongst rodents than would appear from the number of specimens to be met with in museums and elsewhere. Most gamekeepers, when questioned on this subject, could relate stories of the odd things they had seen, but as the animals were of course always in poor condition, and therefore worthless in the gamekeeper's eyes, they were not preserved.

MR. BETTS exhibited models of the mouth of a boy, sixteen years of age, showing a curious mixture of retained temporary teeth and suppression of the permanent. In the upper jaw a bicuspid on either side was absent, also the left lateral incisor, whilst the left permanent canine came down between the temporary canine and the left central. In the lower jaw two bicuspids were absent, and also the central incisors; whilst of the temporary set there remained a central incisor, with which the patient was born, and the roots of a temporary molar.

He also showed a model of the mouth of a boy, twelve years of age, whose canines indicated very plainly the transition between the ordinary canine and the bicuspid. They showed distinctly a rudimentary cusp on the lingual aspect, which was in fact almost as well marked as was the case in most lower bicuspids.

He took the opportunity of bringing before the notice of the Society a drug known as Ethylate of Sodium, which had been used for some time by the medical profession for the purpose of destroying cutaneous nævi, and which had lately been suggested to him as a new remedy for destroying the

nerve. He had found it useless for this purpose, but very useful for obtunding the pain of sensitive dentine, more especially round the necks of teeth where the gum had receded, and where nitrate of silver would be objectionable from its unsightly stain. The dentine should be carefully dried before the ethylate was applied, and the application should be repeated at intervals as the sensibility returned.

A MEMBER remarked that anhydrous oxide of calcium, used quite dry, had lately been recommended in the "Cosmos" for obtunding sensitive dentine. As this was inexpensive and easily procured, it was at least worth a trial.

MR. W. A. HUNT (Yeovil) said that no doubt others besides himself had found an elevator with the blade set at right angles to the handle, very useful for the removal of lower stumps; he had been in the habit of using two of these, made respectively for right and left handed cases. To save the time lost in changing instruments whilst the patient was under the influence of nitrous oxide, he had had an instrument made, which he now exhibited, in which the two elevator blades were attached to the same shaft, so that it could be used for either side, and had found that this conduced very much to rapidity of action.

MR. J. H. MUMMERY then read notes of a case of extensive alveolar abscess, interesting on account of its somewhat obscure origin.

The patient was a powerfully built and healthy-looking young man, thirty years of age, resident in Natal. Before he came to Mr. Mummery he had been suffering for more than a year from abscess pointing beneath the angle of the jaw, there being another opening about an inch and a half below, connected with the first by a tortuous sinus. These openings were continually discharging and were a source of great annoyance to the patient, and he had consulted several surgeons, one of whom sent him to Mr. Mummery with a request that he would remove two molar stumps from the lower jaw on the right side.

He found two necrosed lower roots, which were easily

removed, but could find no sinus leading from the sockets towards the outer openings. The second molar had a small crown filling of white cement, but was otherwise to all appearance healthy—not loose or tender on tapping. The third molar was in place and healthy. Mr. Mummery requested the patient to give him another opportunity of examining the mouth in a short time, but six months elapsed before he came again to have a filling inserted. In the interval he had, under medical advice, taken a voyage to America for the benefit of his health, having been told that the abscess was due to constitutional conditions. No improvement had taken place in the condition of the abscess, except that by compression the patient had succeeded in closing the lower opening, and the sinus between the two had healed; there was still much discharge from the remaining orifice. Mr. Mummery persuaded the patient to submit to another careful examination of the mouth, and found again that tapping the second molar, which had the small cement filling in it, gave no pain; but he now noticed that a slight sensation of pulsation could be felt under the jaw at each tap. The patient said the tooth had been filled a year before he came to England, and he now remembered that he had some pain in it a day or two after it was filled, which, however, soon passed off. Mr. Mummery drilled out the filling, which, though apparently small, he found extended to the pulp chamber, on opening which there was an escape of pus. He then urged the immediate extraction of the tooth, which was done under nitrous oxide, and it was then found that a probe could be passed some distance in the direction of the outer opening. In two days' time the abscess had ceased to discharge, and the patient returned to the Colony the same week. He afterwards wrote to Mr. Mummery stating that the discharge had entirely ceased, and that he had suffered no further discomfort.

The interest of the case seemed to be chiefly in the fact that the diseased stumps first removed had nothing to do with the abscess, and that a tooth which appeared healthy had caused all the trouble. It might be added as a point

of minor interest that the patient calculated that the tooth had cost him, in surgeons' fees, passage money, &c., between £400 and £500.

MR. JOHN FOTHERGILL (Darlington), who was present as a visitor, showed some interesting models.

(1) One of these showed three well-developed bicuspid present on one side of the lower jaw.

(2) Models of the mouth of a young lady, showing the upper central incisors worn away to the extent of about a fifth of their length. The bite appeared to be natural, but on protruding the lower jaw the lower centrals were seen to fit the inequality exactly. Mr. Fothergill could only suppose that she had a habit of grinding her teeth badly during her sleep.

(3) A model of the upper jaw of a young lady, sixteen years of age, showing the ill effects of the too early removal of temporary teeth. On one side neither of the bicuspid were erupted, being impacted between the canine and first molar. On the other side the second bicuspid was kept back by being impacted between the first bicuspid and first molar.

The PRESIDENT then called upon Mr. Betts to read his paper.

Fœtal Hare.

× 50.

Age not known, but
fairly mature.

E. Enamel
organ

D. Dentine.

D.

Nº 1.

Fœtal Rabbit

× 50

Age not known
but early.

E

D

E

D. Dentine

E. Enamel Organ

Nº 2.

Hare × 250.

Adult.

D. Dentine.

e. Enamel.

c. Cementum.

m. Soft tissue.

m

Nº 3.

Rabbit, just born. × 50.

E

D

O

D. Dentine

E. Enamel organ.

O. Odontoblasts.

Nº 4.

D. Dentine matrix.

M. Detached soft tissue.

B. Gas bubble.

B

D.

Nº 5.

Chinchilla

× 50.

Coryu
× 250

Enamel termination.

Nº 6.

Observations on the Teeth of certain Rodents.

By E. G. BETTS, M.R.C.S. and L.D.S.Eng.

MR. PRESIDENT AND GENTLEMEN,

Although the subject that I have to bring before you to-night is of no practical importance to us in the practice of our art, yet I trust it will not be without interest to you and to the members of this Society, as furnishing a small addition to our knowledge of facts in Comparative Odontology, the advance of which science we all have so much at heart, and which now and again helps us so greatly to comprehend the obscure phenomena of human dental physiology and pathology.

Among the problems which remain doubtful in the field of Comparative Dental Anatomy, is one with regard to the disposal of enamel on the incisors of certain rodents, viz., the Leporidæ, a family which includes the hares, rabbits, and calling hares, or picas (*Lagomys*). It has been stated by a German naturalist, Professor Hilgendorff, and by several authors,—whether repeated on his authority or independently I do not know,—that the incisors of hares differ from those of other rodents in having enamel continued all

round them, instead of being limited to the anterior surface, though this layer is exceedingly thin on the back of the tooth.

Now this layer is so thin and apparently structureless, even under a high magnifying power, that it is quite impossible to decide from its mere appearance what its nature may be.

This question, though at first sight of but slight importance, is not without its bearing upon natural history. The order Rodentia, though consisting for the most part of very small animals, the largest not exceeding the size of a small sheep, and the guinea pig representing a fair average, yet from the large number and diversity of the species which it contains, is an exceedingly interesting and well-marked one. In most other orders of mammals it is difficult to frame a general description which shall satisfactorily embrace all types of the order, and species are found so divergent in many respects from its characteristic representatives as to cause it to merge almost imperceptibly into other orders.

This, however, is by no means the case with rodents; although there are tree rodents, water rodents (or at least amphibious), flying rodents, burrowing rodents, and with extremely different external appearance, yet when one comes to examine them more closely, they are found to exhibit such a marked common specialisation that

whilst the tyro could scarcely fail to recognise a member of the order, the most accomplished naturalists have differed in assigning to them their correct position in the animal kingdom. As is always the case in such a difficulty, search is made for some family of the order which seems less highly specialised, and which exhibits some divergent characters which may form a clue to the affinities of the order with others. In such inquiries, it is remarkable how often and how largely the organs with which we have most to do assist in solving the problem, and this is very markedly the case with regard to rodents.

All naturalists have agreed that the Leporidæ are peculiar among rodents, and turn towards them for the divergences which shall help them in their work of classification. Professor Gervais, a great French authority, has given the Leporidæ a sub-order to themselves. All other rodents he groups together as Simplicidents, or simple-toothed, whilst the hares, rabbits, and picas, or calling hares (*Lagomys*), he places by themselves under the name of Duplicidents, the former having but two incisors in each jaw, whilst the latter three groups have a second pair in the upper jaw, though these are very small, and so placed as to be of little apparent use in the economy of their possessors. This classification has been adopted by Alston, Dallas, and others.

The following are some of the particulars in which the Leporidæ differ from the ordinary rodent type. With regard to the teeth, the incisors, though large, are decidedly shorter than in other rodents—that is to say, they are less deeply implanted; for whilst in many rodents the open growing extremity of the lower incisors is placed far under the molars, and even posterior to the last molar, in the hare it reaches only to the first molar, and the upper tooth is correspondingly short. There is, as stated above, a second pair of incisors immediately behind the upper working pair, and in the newly born animal a third pair, which are milk teeth, is present, but these latter are quickly shed. The enamel upon these teeth is white, never pigmented (Waterhouse), and is actually and relatively much thinner than in other rodents, and microscopically it does not exhibit the double layer caused by different direction of enamel prisms, so characteristic of this tissue in all other rodents.

Table showing the actual and relative thickness of the enamel on the teeth of different species of Rodents.

Rabbit	..	..	$\frac{1}{500}$	about	$\frac{1}{30}$
Hare	..	..	$\frac{1}{400}$	„	$\frac{1}{30}$
Lagomys	..	..	$\frac{1}{160}$	„	$\frac{1}{8}$
Marmot	..	..	$\frac{1}{100}$	„	$\frac{1}{100}$
Guinea pig.	..	..	$\frac{1}{250}$	„	$\frac{1}{17}$
Agouti	..	..	$\frac{1}{100}$	„	$\frac{1}{13}$
Copybara	..	..	$\frac{1}{115}$	„	$\frac{1}{25}$
Beaver	..	..	$\frac{1}{140}$	„	$\frac{1}{36}$

Coypu	$\frac{1}{50}$	about	$\frac{1}{19}$
Porcupine	$\frac{1}{100}$	"	$\frac{1}{12}$
Chinchilla	$\frac{3}{50}$	"	$\frac{1}{10}$
Hydromys	$\frac{1}{100}$	"	$\frac{1}{7}$
Field mouse	$\frac{1}{200}$	"	$\frac{1}{6}$
Brown rat	$\frac{1}{200}$	"	$\frac{1}{26}$

The difference in thickness I think very worthy of notice, and have prepared a table showing the actual and relative thickness of enamel in a number of species. The relative thickness, as stated in this table, however, is open to fallacy, as I have compared the thickness of the enamel with the antero-posterior diameter of the tooth, and some rodent incisors are laterally compressed, whilst others are greater in the transverse measurement; this, however, does not materially affect the general object of the table, viz., to show the comparative thinness of the enamel in Leporidæ. This family also possesses a larger number of molars and premolars—six in the upper and five in the lower maxilla on either side; the usual complement being three, four, and in one case, the Australian water rat (*Hydromys*), only two.

The crania of Leporidæ differ in several respects, and the jaws have more lateral play, those of other rodents being almost entirely confined by the antero-posterior elongation of the glenoid cavity, to a backward and forward motion.

Leporidæ possess very imperfect clavicles, whilst most rodents have well-developed ones; this is a

marked divergence, the presence of a clavicle having relation to the use of the forearm as a means of conveying food to the mouth, after the manner of a hand.

Finally, Leporidæ are almost exclusively herbivorous ; hence the greater length, volume and complexity of the cœcum, the lateral play of the jaws, &c.

It will thus be seen that there is ample reason for looking upon Leporidæ as an aberrant type of rodents, and it would round matters off nicely, and be an appropriate finish, if it could be proved that the enamel of their incisors possessed, in common with most other mammals, a complete investment of enamel. This is the matter to which I have been devoting my attention for the past few months, but unfortunately the evidence that I have been able to collect points in the opposite direction, and I think you will agree with me, when I have laid it before you, in pronouncing that no complete investment of enamel exists. At the same time I think this need not be in the least a discouragement to naturalists in their theory, as the very difficulty of speaking with certainty on this point, and of demonstrating it, is but one more fact in the chain of evidence to support the claim of the Leporidæ to being the family of rodents most nearly related to the rodents' "missing link."

I need hardly remind my hearers that in the more typical rodents the enamel is exceedingly thick on the anterior surface of the incisors, but comes to a more or less abrupt termination a little way round on the lateral aspect of the tooth, either standing out as an abrupt plaster-like mass, or tapering off to a more or less acute point, or, as in the common rat, being accommodated in a depression of the dentine. I have made diagrams of these various forms of termination, as seen in transverse section under the microscope, and you will observe that the hare gives this diminution in such a gradual manner, that it is almost impossible to say where, if at all, the enamel ends; but that it does end I think may be seen in a very thin section, and I have several that seem to me to show it (fig. 3).

Unless the section be very thin, the enamel appears to be continuous with a thin transparent line, which passes round the back of the tooth, and this is what has been regarded as a thin layer of enamel.

With a thin section and oblique light, on close inspection, the thin transparent layer may be detected passing on to and slightly overlapping the termination of the enamel, in the manner it is plainly seen to do in some other rodents, the chinchilla, for example (fig. 6). Moreover, this thin transparent layer is just as marked in many other

rodents' incisors, so that they might with equal propriety lay claim to an enamel investment. But from the relation of the various tissues which I have described, and arguing from analogy of other teeth where in all cases the cementum takes a position external to the enamel, and overlaps it, as it does in human teeth to a small extent, we have good reason for uniting with Mr. Charles Tomes in his suspicion that the bright transparent line is not enamel, but cementum.

On examining the tooth germs of foetal hares and rabbits, to see whether the enamel epithelium extended round the back of the tooth, and if so whether of such degree of development as to be likely to form enamel, I found that in very young germs there was an investment of enamel cells, though of a rather less perfect description, and forming a shallower layer on the back than on the front of the germ, yet such as one might well give credit for forming enamel. I found, however, in foetal (hare) germs of greater maturity, and in a newly born rabbit (figs. 2 and 4), that the enamel cells terminated just round the corner of the tooth, diminishing in size somewhat rapidly, at about the position where the enamel of an adult tooth merges in the thin transparent layer before mentioned. The result of these observations is the assumption that at a very early stage of development, the enamel organ forms a complete cap to the dentine as in

other animals, and perhaps at first even deposits a cap of enamel, but that it soon wastes and ceases to be present in the subsequent continually growing tooth. This is what one would rather expect to find from what one knows of the behaviour of enamel epithelium where it does not intend ultimately to produce enamel, and which has been so clearly set forth by Mr. Charles Tomes, in speaking of the development of enamel of fishes, and of the eel more particularly. In some sections taken transversely of adult jaws, with the teeth *in situ* and decalcified, I observed that whilst a gap was exhibited on the anterior border of the tooth where the enamel had been dissolved away, no such gap appeared on the posterior aspect of the tooth, but, on the contrary, the connecting fibres of the periosteum ran straight on to, and seemed firmly inserted upon, the decalcified matrix of the tooth. This leads me up to what, to my mind, seems the strongest proof of all of the non-existence of the posterior layer of enamel in Leporidæ, and one which I think quite conclusive. It is the result which one obtains by treating a fresh section of hare or rabbit tooth, whilst under a microscope, with a strong mineral acid.

The section should be fresh, or, better still, have remained in alcohol for a few hours; it should include the alveolus and intervening periosteum. By the time it has been rubbed pretty thin on the

hone, the alveolus will probably, unless considerable care has been exercised, have been torn away from the tooth, but leaving the peridental membrane firmly attached to the tooth (this itself is worthy of notice, in passing, as one could scarcely imagine so close an adhesion to enamel alone). If the tooth be now placed in a drop of water on a slide under a cover-glass, so that the point of suspected termination of the enamel, together with the continued transparent layer, be within the field, and a drop or so of pure hydrochloric acid added with a glass rod at the upper border of the cover-glass, bubbles of gas will soon appear and be rapidly evolved from the decomposing enamel and dentine, lifting and pushing aside as they make their escape the thin layer of soft tissue from the margin of the tooth, and presently the enamel has entirely disappeared, leaving the soft tissues which formerly adhered to it entirely separated from the dentine up to a certain point, viz., that at which the enamel was suspected to terminate: here it now presents a *cul-de-sac*, nor can any reasonable amount of force, such as one can produce by violently agitating the cover-glass, and which is sufficient to make the loose soft tissue lash violently to and fro, induce it to part company with the tooth to any farther extent, which, had there been even the thinnest layer of enamel intervening, it could not fail to do. I have made a

drawing of such a section as I have described (fig. 5), and I think there need not be stronger proof of the absence of enamel from the back of the incisors of Leporidæ.

To sum up, therefore, we find on examining foetal teeth that in the earlier stages the enamel cells completely surround the tooth, being, however, rather less developed on the posterior aspect; but that in later stages of the foetus, as also in the newly-born animal, it is distinctly confined to the anterior aspect of the tooth. In examining hard sections of adult teeth we find similar arrangement of the tissues, and anatomical appearances similar to those observed in other rodents, only in a less marked degree; and that in preparing such sections the peridental membrane shows marked unwillingness to leave the back of the tooth; that in sections hardened in chromic acid and decalcified, the membrane of attachment is seen to run on from the alveolus to the matrix without appreciable interruption; and added to all this we find, on watching the process of decalcification, that the soft tissues are separable to an extent corresponding with the apparent termination of the enamel, and no further. I think, therefore, Gentlemen, that you will endorse my view, that the Leporidæ, in common with all other rodents, possess *no* posterior investment of enamel upon their incisor teeth.

DISCUSSION.

MR. ARTHUR UNDERWOOD said he thought Mr. Betts was to be congratulated on having very completely established his point—a point which, though at first sight unimportant, was of considerable zoological interest. His own attention had only been called to this matter quite recently by hearing that Mr. Betts was investigating it, but feeling anxious to observe for himself, he obtained a young rabbit, and cut some sections of the teeth. These were cut fresh and examined at once, and the result of his observations, though far less numerous and carefully made than those of Mr. Betts, was identical with that stated in the paper. He thought the abrupt ending of the enamel was clearly shown in some of his own preparations, but he had not thought of the ingenious application of strong acid which Mr. Betts had made use of to demonstrate this point still more clearly.

MR. CHAS. TOMES said the point which Mr. Betts had investigated was really of considerable importance in itself, and still more so because, having once been stated and published on apparently good authority, it had been accepted as true and copied from one book into another, until, as he was surprised to find when his attention was called to it, this statement as to the complete investment of enamel on the teeth of the Leporidæ had even made its appearance in some of the more recently published students' text-books as if it was an unquestionable fact. It was therefore high time that it was contradicted. The widely published statement that the ancient Egyptians were acquainted with the art of filling decayed teeth with gold, appeared to have got about in much the same way. For on tracing it back to its source he found, after taking a considerable amount of trouble, that the statement rested on the authority of a man who wanted to sell a mummy, and that the supposed specimen of gold-

filling had not actually been seen by the person who published the statement.

The zoological relations of the Rodentia formed a very puzzling chapter in Natural History. We had a precise knowledge of the ancestry of the horse, and could trace the stages by which its hoof was derived from the foot common to a large number of mammals, and the same might be said of its teeth. So with regard to many other special adaptations of particular organs; thus we could trace the origin of the snakes' poison fang. But of the genealogy of the rodent's incisor we knew nothing at all; it appeared on the scene, so to speak, in the full development of its peculiarity. Had it been true that the Leporidæ possessed teeth with a complete investment of enamel, this would have indicated a transitional form, and would have supplied one of the missing steps. But Mr. Betts had disproved this assertion.

Possibly some of the missing links might yet be supplied by a careful study of the Marsupial class, seeing that in them we have a group of creatures which have adapted themselves to a variety of habits and of food, some of whom approximate in a rough way towards a rodent type of dentition in the great development of their incisors, the wide gap behind them, &c.; but this was only a conjecture, to which too much weight must not be attached.

MR. BETTS, in reply, said he was much obliged to Mr. Underwood for his corroboration. The rodents were in several respects a very interesting group, and still offered several unsolved problems to be worked out. In the case of many other peculiarly formed animals, or apparently isolated groups of animals, their relations could be traced through others which were now extinct; but even this clue failed in the case of the rodents, for, so far as was at present known, they did not appear until a comparatively recent geological period, and the fossil specimens appeared to be very much like those now existing.

The PRESIDENT said he had very great pleasure in conveying the thanks of the Society to Mr. Betts for his paper. It was

one of considerable scientific value; and although papers on so-called practical subjects which could be more generally discussed were no doubt popular, still such a one as this helped to raise the status of the Society and its Transactions in the eyes of the scientific world, and he hoped that the results of other investigations of this sort would continue to be brought before the Society from time to time. He had also to express the thanks of the Society to the various donors of specimens, and to the readers of Casual Communications that evening.

The next meeting of the Society would take place on Monday, June 9th, as the first Monday in June happened to be Whit-Monday, a Bank Holiday, which would be a very inconvenient day for many of the members, especially for those who came from a distance.

The Society then adjourned.

CORRIGENDUM :

On p. 218 of the last number of the Transactions, third line from top, for " Mr. George Parkinson," *put* Mr. James Parkinson.

Odontological Society of Great Britain.

ORDINARY MONTHLY MEETING.

June 9th, 1884.

J. SMITH TURNER, M.R.C.S., L.D.S.Eng.,
PRESIDENT, IN THE CHAIR.

The Minutes of the previous meeting having been read and confirmed,

The following gentleman was balloted for and elected a Non-resident Member:—

RICHARD THEODORE STACK, D.M.D. Harvard, M.D.,
Dublin, F.R.C.S.I.; Professor of Dental Surgery,
Roy. Coll. Surg. of Ireland; Surgeon to the Dental
Hospital of Ireland, &c., 10, Westland Row, Dublin.

MR. D. HEPBURN announced, in the absence of Mr. Weiss, that Mr. Tod, of Brighton, had presented to the Library a framed engraving of a picture by Gerard Dow representing a Dutch dentist.

MR. HUTCHINSON reported that some valuable additions had lately been made to the Museum. Mr. Charlesworth had presented two enamel plates of the molar of an Indian elephant. These were interesting inasmuch as they showed how an elephant's molar was built up; the plates of enamel were first formed, then filled up with dentine, and the space between them afterwards filled with cementum, thus uniting them into one solid tooth.

Mr. Charlesworth had also sent a portion of the upper maxilla of a horse, dissected in such a way that the bony implantation of the molars was well displayed.

Mr. Hutchinson added that the Council had authorised him to purchase some very interesting specimens which had not hitherto been represented in the Museum. Amongst these was a very fine skull and lower maxilla of a rhinoceros with the entire series of molars complete and perfect, including the first molars, which were very small and usually wanting in rhinoceros crania. The lower maxilla had also all the molars perfect, and had the left outer large incisor in place as well as the two inner small cylindrical incisors; the right large incisor was missing, its socket having been filled up with a bony deposit. The rhinoceros offered very interesting dental phenomena; the three or four species found in Africa had incisors in the foetal state which never cut the jaw. But in the Indian rhinoceros these incisors arrived at maturity, and presented the characters shown in this specimen. These crania were, however, very rare and difficult to procure.

The other specimens were a cranium and lower jaw of the *Tapirus Bairdii*, with some of the permanent molars in a germ state; the cranium and lower maxilla of a young tapir, showing deciduous molars, canines, and incisors. These specimens, though osteologically imperfect, were interesting and rare from a dental point of view, as the incisors and canines were rarely complete in these crania. The next four specimens were portions of the upper and lower maxilla of the *Tapirus Americanus*, and were supposed to have belonged to the same individual.

He had also to acknowledge the receipt of a plate, made for a syphilitic case, from Mr. Pink, and a lower jaw from Mr. G. W. Skipp, which had been found near Essendine, in Lincolnshire, together with some Roman remains and coins; it was in remarkably good preservation, the teeth being very perfect.

He would also call attention to a beautiful specimen of a fossil tooth of the mastodon sent for exhibition by Mr. Charlesworth.

MR. CHARLESWORTH said the specimen he showed was a

very perfect tooth of the *Mastodon Andium*, described by Cuvier forty years ago, but which was exceedingly rare. The common form was the *Mastodon Ohioticus*, of which nearly four hundred specimens were to be found in different collections, whilst of the *Mastodon Andium* he did not believe there was another example as perfect as that which he then had the pleasure of showing.

MR. STORER BENNETT showed a curious old instrument for extracting teeth which had been handed to him for the Museum by Mr. Hawksley. It consisted of a small vice with a jack-screw on one side. When this was fitted on the tooth, the screw adjusted, and a sufficient amount of leverage applied, it was evident that *something* must come. He had looked through the collection of old instruments in the Museum, amongst which were some very remarkable contrivances, but there was not one similar to this.

MR. W. E. HARDING (Shrewsbury) said that about four years ago he was called upon to treat a case of serious injury to the deciduous upper incisors, and he thought the sequel of the case might be interesting to the Society. A child, then three years old, seized up the baby's feeding bottle, ran away with it round the room, and fell, striking the upper centrals against the bottle. When Mr. Harding saw her he found the root of one tooth projecting through the floor of the nostril, whilst the other was displaced backwards. He drew down the one and brought forward the other into place, securing them with ligatures to the neighbouring teeth. In the course of the next ten days the tooth which had been brought down from the nostril became loosened by suppuration and came away; the other became firm. The parents were now anxious to know whether any injury to the permanent teeth would result from the accident, as to which Mr. Harding himself did not feel quite free from misgivings, though he gave a hopeful prognosis. The child was now seven-and-a-half years old; the centrals had lately been erupted, they appeared quite healthy, and free from any sign of injury. Mr. Harding thought that the root of the tooth

must have been driven upwards and slightly outwards, thus missing the germ of the permanent tooth, which would be behind it.

Mr. Harding said he had lately performed rapid and forcible torsion on an upper central, and the result had been very satisfactory. Three months had elapsed since the operation; the colour and translucency of the tooth were quite unchanged, and the pulp appeared to be living and healthy.

He also showed a model of a case which he had lately had under his care, in which the crowns of the incisors had been entirely destroyed by an edge-to-edge bite, the pulps having been completely calcified and the pulp chambers obliterated. He had never before met with a case in which such thorough destruction had resulted from this cause.

MR. S. J. HUTCHINSON said that about four years ago he met with a case somewhat similar to that related by Mr. Harding. A child aged two-and-a-half had one of the upper centrals knocked out by a fall, and the same inquiries were made as to the effect on the permanent dentition. His reply was that the appearance of the permanent tooth might possibly be delayed, but that it would probably come through all right. The tooth had lately appeared and was quite uninjured, though inclined forwards; but as two of the patients' sisters had the same deformity, it was probable that this was a family peculiarity and not due to the accident.

MR. OAKLEY COLES said he was not quite sure that Mr. Harding had adopted the best course in treating this case. Would it not have been wiser to have removed the tooth at once, rather than to leave it as a possible centre of suppuration?

DR. ST. GEORGE ELLIOTT said he should be glad if any member of the Society could give him some useful hints with regard to the treatment of dental hyperæsthesia. The case he had in mind was that of a lady who came to him complaining of the most exquisite sensitiveness in the right upper lateral. Every part of the tooth was sensitive to the

slightest contact, so that the patient could not drink or take food without suffering acutely. All the usual remedies were tried, but without any improvement resulting. Then the canine began to be affected in the same way, and as treatment appeared hopeless and there were cavities in both teeth, Dr. Elliott very reluctantly destroyed the pulps.

He next exhibited a set of nerve broaches, the points of which had been made in his own workroom of piano wire. Pieces of wire about $1\frac{1}{2}$ inch in length were mounted in the engine, and made to revolve between a larger moving corundum wheel and a piece of the same. Donaldson's bristles were expensive and too pliable, owing to their length, whilst these were easily made and answered the purpose admirably. The handles were made of celluloid, of different colours, and aluminium bronze. This had the appearance of silver, but was bright and did not tarnish; it was rather a difficult alloy to work, but was very useful for such purposes as this.

Dr. Elliott also showed in a tabular form the result of a series of observations which he had made with the view of ascertaining which was the best form of battery for use with the electric mallet. It was important for this purpose to have a battery of high electro-motor force, one which did not rapidly deteriorate, and did not require much attention. Those which he had selected for comparative observations were the Leclanché, the Lund, and a modification of these in which the area of the carbon was increased fourfold by having two pieces instead of one, and drilling holes through these; the two carbons were also platinised. The element was constructed of two perforated carbons and three Leclanché agglomerate blocks; the zinc was placed in a tray of vulcanite suspended just beneath the carbons, and was immersed in mercury. The experiments were carried out chiefly for the purpose of ascertaining whether these changes were of any real value.

The following table gives the results obtained. First the electro-motor force (E.M.F.) of each cell is given. The Leclanché being rather old, though clean and freshly charged,

the E.M.F. is not quite as high as it might have been. The cells were next placed on short circuit, and their condition tested at the end of one and two hours in the case of the Leclanché, and up to five hours with the others. The Leclanché having in two hours lost more than half its E.M.F., was then put on open circuit and tests taken every hour for four hours, with the results as shown. At another time the tests were made for ampère.

In the case of the Lund, the tests were first applied to it in its original form. Then Dr. Elliott's double carbons were put in instead of its own, and the result noted. The third column gives the result of the tests as applied to this double carbon form.

It may be stated for the purpose of comparison that the Bunsen battery supplied by the S.S. White Manufacturing Company is stated by the makers to have in the four cells 5.46 volts E.M.F., 3.8 ohms resistance, and 1.43 ampère.

LECLANCHÉ.		LUND.		ELLIOTT.	
E.M.F. 1.1 Volts. Short Circuit.		E.M.F. 1.5 Volts. Short Circuit.		E.M.F. 1.6 Volts. Short Circuit.	
hours.	E.M.F. in Volt.	hours.	1 carbon. E.M.F.	hours.	E.M.F.
1	.6	1	.8	1	1.16
2	.5	2	.7	2	1.
		3	.6	3	.9
		4	.6	4	.9
		5	.6	5	.9
Open Circuit.		Open Circuit.		Open Circuit.	
hours.	E.M.F. in Volts.	hours.	1 carbon. E.M.F.	hours.	E.M.F.
1	.8	1	1.	1	1.2
2	.9	2	1.16	2	1.4
3	.9	3	1.16	3	1.4
4	1.	15	1.4	15	1.5
5	1.				
6	1.				
AMPÈRE.		AMPÈRES.		AMPÈRES.	
At starting	...	At starting	...	At starting	...
5 mins.	...	5 mins.	...	5 mins.	...
15 "	...	15 "	...	15 "	...
In 2 hours short circuit lost	.. .6 E.M.F.	In 5 hours short circuit lost	1 carbon. .9	In 5 hours short circuit lost	.. .7 E.M.F.
In 2 "	open circuit recovered .4 "	In 3 " open circuit recovered..	.56	In 3 " open circuit regained	.5 "
		In 2½ "	—		
Internal resistance ... 3.50 ohms.		Internal resistance ... 1' ohm.		Internal resistance... .. 1' ohm.	

MR. STORER BENNETT said that for two years past he had had in use in his house a four-celled battery supplied by the Gutta-Percha and Telegraph Company, and during the whole of that time it had not required any readjustment or attention of any sort. It was originally constructed by the Company for blasting puposes; he had a similar battery to work the electric bells which with the house was fitted, and this also had given no trouble whatever.

In answer to a question from Mr. Browne-Mason, Mr. Bennett added that the battery was contained in a closed box, and that he could not state what its interior arrangements were, as he had never had occasion to examine them. Evidently, however, the carbons were always immersed, the battery being ready for action at all times without any manipulation being required.

MR. BROWNE-MASON (Exeter) said he should be glad to know something more about Mr. Bennett's battery, since his experience had been very different. He had obtained a battery from the Dental Manufacturing Company, and at the end of a fortnight it appeared to be completely worn out. He thought there must be a considerable amount of waste if the carbons were kept immersed in the solution when the battery was not in use.

MR. W. H. COFFIN said the Leclanché battery possessed several advantages as regards durability and economy of working, but as ordinarily met with it was not constant enough for many purposes. The strength of the current might, however, be very greatly increased by sufficiently enlarging the surface of the carbons, and the batteries now used for blasting were on this principle.

By a recently discovered process, the patent for which had not yet been fully secured, agglomerated blocks of carbon and peroxide of manganese of very large size could now be made. These could be set up in very tall jars or lengths of glazed earthenware pipes with rods or strips of zinc excited in the usual manner with solution of chloride of ammonium.

Such a battery would work for several years and require very little attention.

DR. FIELD said Dr. Bodecker, of New York, had a battery of twenty Leclanché cells, of which he used ten at a time, alternately; he used this for probably eight hours a day. It had been in use eighteen months, and was still working as well as ever.

DR. ELLIOTT replied that the objection to the Leclanché battery was that the intensity of the current ran down very rapidly when placed on short circuit, but on a long circuit this was not the case; it was therefore a very good battery for telegraphic purposes. As to the question of waste if the elements were kept immersed in the solution, this did not take place to any appreciable extent if the zinc was thoroughly well amalgamated. He could add from personal experience that but little reliance could be placed on estimates of the average daily use of a battery unless these were based upon daily notes. For some months past he had kept an accurate account of the time his batteries had been in use, and whereas he should have stated the average daily time at from two to three hours, he found that the actual average over a considerable period was scarcely one hour.

PRESENTATION OF PORTRAIT OF MR. JOHN TOMES, F.R.S.

MR. JAS. PARKINSON then rose and said:—

“Mr. President, With your permission I desire to occupy a few minutes of your time this evening to make a communication which will, I trust, prove both gratifying and pleasurable to yourself and the members of the Society.

“In the early days of this Society, up to the year 1861, we were presented with the portraits of the retiring Presidents. But in 1862 Mr. John Tomes, the President of that year, with characteristic unostentation, substituted for his portrait a handsome prize on a subject of great importance, a Treatise on Dental Caries. In one sense I regretted this, since no member of our body could more worthily or deservedly occupy a space on our walls.

“Since the period I have mentioned, it has been frequently on my mind to seek an opportunity of securing a portrait of Mr. Tomes, and I am pleased to say this opportunity offered itself a few months since. So, with the co-operation of some of his old friends, we overcame his scruples and prevailed on him to sit for this portrait by Mr. Macartney, for presentation to the Society.

“On referring to a period previous to the formation of this Society we find John Tomes a constant and earnest worker in our interests, in the foremost rank in promoting any measure calculated to bring into harmony the scattered members of the dental calling. His devotion to the cause of education, his late labours to secure for us a professional recognition by an Act of the Legislature, are so well known to you that I feel it is needless to add more on these subjects. It is greatly to be regretted that the indifferent state of his health of late years has prevented his appearing among us as often as we could desire, but this has not prevented his watching every opportunity, when occasion offers, of securing our present privileges, or of adding importance to the profession of which he is so distinguished a member.

“I will no longer detain you, except to request you, Mr. President, on behalf of the Odontological Society of Great Britain, to accept this portrait, trusting that it will always be an object of interest and pleasure, and be duly valued by the present and future members of this Society.”

The picture having been uncovered amidst hearty applause, the PRESIDENT replied:—

“Mr. Parkinson and Gentlemen, I have great pleasure in congratulating the Society on the acquisition of a picture which is valuable both as an excellent likeness of one whom we have all learned to regard as a friend and benefactor, and also for its skilful execution and finish.

“It is not necessary for me to pass an eulogium on John Tomes. All here know the high social position which he holds, the wide scientific reputation which he enjoys. All must regret that failing health has prevented him from

coming to our meetings. But though absent in the body, he is present with us in spirit. Unlike others, who when they retire from practice cut themselves off from their fellow men and pass the rest of their lives in more or less selfish indolence, he has devoted his time and strength to furthering the welfare of his profession. To contemplate the life of such a man is a moral tonic to us all.

“In the name of the Society I thank Mr. Parkinson and the other kind friends who have secured for us a priceless treasure in this portrait of John Tomes.”

The PRESIDENT then called upon Mr. Oakley Coles to read his paper.

The Maintenance of Health amongst the Practitioners of Dental Surgery.

By OAKLEY COLES.

THE maintenance of health, as part of the title of this paper, implies an extra liability to disease, and it may perhaps be well that I should at once make out a case of increased liability to disease amongst the practitioners of dental surgery.

Let me then start with the assertion that the practice of dental surgery, as carried on by the successful and fully occupied practitioner, is injurious to health for these reasons :

- (1) He works, as a rule, in one room, in which the atmosphere is but imperfectly changed and renewed during the day.
- (2) He works in a constrained position, in which some of the muscles become tired from undue use, and others cramped from insufficient use.
- (3) He is subject to the risk of having to breathe, sometimes for more than an hour at a time, air that is diluted with the expired air of a patient who may be in robust health or the subject of chronic or acute disease.

- (4) He is under the necessity in most cases of causing discomfort, and in many cases of giving positive pain, and under both conditions he is expected (and the expectation is usually satisfied) to be thoroughly in sympathy with the patient. This sort of sympathetic feeling, kept up for seven hours—that is, from 10 till 5—seems to me rather more exhausting than even Mr. Cumberland's thought-reading.
- (5) The dental surgeon is, further, limited in his operations to a very small area of vision for work: the adjustment of the sight must be perfect, the look must be intense; the light may or may not be perfect, and he may, beyond the accident of bad light, have to wear glasses to compensate for prematurely worn out adjustment, and use a mirror to see into a cavity on the distal surface of a tooth.
- (6) The accident of temper (good or bad), whether his own or anybody else's, is a factor that must be taken into account, though it cannot be reckoned with.

Moderately as I have stated my case, I believe it to be sufficiently strong to prove my first proposition, that the successful practice of dental surgery is injurious to health. It will be noticed that I emphasize "successful practice," and for

this reason, that a man whose time is not fully occupied is not subject to the conditions I have referred to; neither is a man who never puts in a large gold-filling, or carries out any other elaborate operation, though to all of us the rule will apply in a greater or less degree.

Let it then be granted that the maintenance of health is worthy of more consideration than we have perhaps given to the subject, what can we do?

- (1) Have an operating room as large and lofty as we can get it, so that its cubic atmospheric capacity may be considerably above the average.
- (2) Have the floor covered with parquet work and the walls sized and varnished, so that they may not retain the fumes of any drug used during the day, or form a surface of attachment for the dust that is raised by traffic over the boards.
- (3) Have a Tobin's ventilator opening near the operating chair, so that there may be a constant change of air in the neighbourhood of the patient and operator.
- (4) Keep a fire alight as long as there is any possible excuse for it, and when that cannot be done have a small gas jet in the stove of sufficient strength to produce an up current in the chimney, and so

keep a valve ventilator in the chimney breast in good working order to carry away the warm air of the room.

- (5) If possible, use only one window for the purposes of operating—that is, if you have more than one in the room—shutting out the light from the second window by a dark blue blind. Experience will show that it is easier to work under these conditions.
- (6) Have the window opening low if it be clear of buildings in front, or, failing this, have reflectors to throw up the light on the upper jaw. When it is possible, a top and front light combined is better than a mere front light.
- (7) Let the glazing be of thick plate glass, to avoid the convection currents that produce the draught from thin sheet or crown glass.
- (8) The light may be further increased by side mirrors fixed on “the splay” on either side of the shutter boxes. These should be carefully arranged so that the angle of reflection may be of service for increasing the light in the patient’s mouth.
- (9) The operating chair should be of a form that enables the practitioner to do his work with the least fatigue—what form

that may be is more than I would pretend to say.

- (10) I will only lay down two rules : it should not be so low as to compel the operator to stand directly over the patient, and so increase his liability to take the patient's breath ; and it should not be so high as to require the arms to be raised above the shoulders, and thereby injure the heart by compelling a greater muscular effort to send blood to the brain.
- (11) Those who can operate sitting down will find great comfort from the use of an ordinary music stool, or a sportman's portable seat, or a Lyons adjustable seat.
- (12) In standing it is often a great relief to rest one foot on a stool for a few minutes, and some American operating chairs have, I find, recently been made with this addition at the back of the chair.
- (13) With regard to spittoons, they should be of glazed earthenware, and be so adjusted that a fresh one may be brought into the room for each patient ; the old-fashioned pedestal, or tube spittoons, have always been in my experience a source of trouble, from the difficulty in keeping them free from smell.
- (14) As to the arrangement of cabinets, instru-

ments, and brackets, and lighting by gas, every one must please himself, and it is scarcely likely that any two people will agree, either as to what they want or how to get it.

- (15) There is only one point to be considered : avoid, if possible, an arrangement that compels you to be constantly turning round, or half round, to get at your cabinet or bracket. It produces giddiness and upsets your sight.
- (16) As to food it is impossible to formulate anything that is likely to be available in any considerable number of cases. I think there should be a rest in the middle of the day for luncheon, though I have known some men work without such a midday meal for years, whilst I have heard that others have been fed whilst operating by some fairylike hand-maiden carrying food in the hollow of a silver spoon to the lips of the too much occupied practitioner.
- (17) There are two suggestions as to dress that may be conveniently made here : one is to wear woollen socks and thick-soled boots, and thereby save the extreme sense of fatigue that is otherwise often felt in the feet and ankles ; and the next point

is to wear either a broad belt or flannel bandage round the loins, so as to preserve the body from chill when in leaning over in a constrained position the vest is displaced and the waist left with insufficient covering.

- (18) My last suggestion refers to the hours that we should devote to work in the operating room. These I would put at from half-past nine in the morning till three in the afternoon, allowing out of that time half-an-hour for luncheon, and doing this only for eleven months out of the twelve.

I have thus far been dogmatic in my statements in order to provoke discussion, and perhaps contradiction; for on the subject that we have before us we may hope to gain more from the experience of the many than the observations of any single individual.

May I now be allowed to draw attention in a less precise form to some of the aspects of our professional life, in so far as they affect the maintenance of health?

What a change has taken place during the last twenty-five years! How much more our patients expect at our hands, and, happily, how much more we are able to do for them! Think of the laborious character of some of the operations of the present

day, and think also of the relative rapidity with which they can be performed. The burring engine and the electric mallet are doubtless wonderful labour-saving machines, but are they such brain-saving machines? If we can do now in one hour work that formerly took three hours, and we see now three patients when formerly we should only have seen one, is the gain in time an unmixed good? Are we not, by economising labour, and thus seeing more patients in a given period, keeping up the same distance and enormously increasing the pace, and is it not the pace that kills?

I know there is a fascination about some of our work in the present day that, even when we are jaded and sickly, keeps us at it, and it seems as if "the labour we delight in physics pain," but is it always the right drug to use?

We are practising a section of general medicine at the present time under conditions that no other branch of our profession is subjected to; we are doing all our work in one room under most unfavourable hygienic surroundings, and for at least three hours longer than the busiest physician or surgeon devotes to his profession in his own consulting room, either in London or the provinces. We have no change of scene from one patient's house to another, no intervening carriage drive when the lungs may be filled with fresh air, and the tired limbs are in a state of temporary repose.

We have not simply to listen at our tables, quietly sitting down, to a long list of complaints and analyse a chain of symptoms: we have in nearly every case to undergo a definite and often considerable amount of muscular as well as mental exertion, and we have to do this, under the circumstances that I have already described, for double the time that the ordinary consultant devotes to his home practice.

Is it wonderful that some of us break down prematurely? Is it strange that when we have finished our work and dined without appetite, we are glad to go to bed, only to sleep without refreshment.

It would be too painful, though it might be sadly useful, if we could give out the names of those whom we have seen during the last twenty years fail utterly in health and enterprise. Most of us can recollect men who are dead and gone, simply from over-work, whilst we can call to mind the familiar faces of those who have had to stand aside out of the race of professional life, and feel that their part in it has been taken by some one else.

In all earnestness I would ask, is our policy of hard work and long hours a wise one?

Granted that you may grow rich early in life, and then rest; but will it be the rest that gives any capability for enjoyment, or a very weariness

of the flesh, in which pleasure shall seem but as dead sea fruit?

Some of us can stand the strain for a longer time than others, but very few can stand it for an ordinary professional lifetime. Failing sight, impaired digestion, or some organic change, tell their own tale to ourselves, if not to our friends.

Beyond all this, is it just that our entire energies should be used up in the way of merely living and making money? Surely we may claim some time for the enjoyment of "the sweet humanities of life and culture."

The higher standard of education, general and professional, to which we have attained has primarily increased our usefulness to the commonwealth that we are prepared to loyally serve, but it has enlarged our capabilities in other directions as well, and it may often happen that a man's best work will be done outside the round of his usual avocation; yet, as things are, how little time many of us have for this larger and sometimes higher sphere of labour. We must face this problem. It is the very curse of specialism that a man's views become as "cribbed, cabined, and confined" as the area in which he may practise his most beneficent department of medicine. Other interests, other pursuits—nay, if you will, a fresh set of worries, but a time of change, relaxation, and excursion into pastures new we all require. And

I do not see how we are to get them if we work till we are worn out with fatigue, or have so utterly failed to maintain our health as to have lost all capacity for any form of usefulness or enjoyment.

Outdoor exercise, fencing, and athletics will doubtless do a large amount of good, but my case is that, as we work now, most of us are too tired out to find relaxation in such pursuits. To shorten our hours would doubtless involve many changes in our present arrangements, but scarcely so great a change as an utter breakdown in health would necessitate; whilst by improving our physical condition it would at the same time increase our capabilities of usefulness to our patients.

It may be thought that the discussion of this subject lies outside the domain of this Society, but it seems to me that a body that devotes itself to the progress of dental surgery may wisely, as well as fairly, discuss the hygienic conditions essential for its members.

DISCUSSION.

THE PRESIDENT having invited discussion, remarking that the subject was one which had an interest for all, and he expected that nearly every one present would have something to say about it,

DR. GEORGE FIELD said he had had some experience of bad health, and should be very glad to find a means of escaping it in future. He thought that the fact that dentists, as a rule, worked in a room having a northern aspect, was one element affecting their health; they did not get enough sun. For the last four years he had worked under a south-west aspect, and he believed he had been the better for it; the light was somewhat changeable, but he did not find this a serious objection. It was all very well to advise shorter hours of work, but in order to do this the practitioner must obtain higher fees; five or six hours' work at the customary fees would produce only bare subsistence. It was certainly desirable to shorten the hours of work, but the only way in which this could be done was by every practitioner doing his best to raise the appreciation of professional services in the estimation of the public. It was impossible altogether to do away with the insanitary conditions under which dental practitioners were obliged to work, but a great deal might be done by careful attention to ventilation, and Mr. Coles' suggestions on this head were excellent. He himself was accustomed to work with an open window whenever the weather would permit. Lastly, there was the question of exercise, and as to this he would suggest to those who had not tried it, a remedy which he had found eminently beneficial in his own case, viz., the use of a tricycle. He found that even after a hard day's work he could do two or three hours on his machine, and return invigorated by the fresh air and exercise.

Mr. W. E. HARDING (Shrewsbury) said the reference to the use of a stool by Mr. Coles induced him to state his own experience on this point. He had formerly been in the habit of always standing at his work, and, being tall, he suffered severely from pain in the back, caused by stooping. At last he got a Lyons stool, and he now did about half his work sitting, and found it a very great relief.

Dr. FIELD said he had been accustomed to sit at his work for some years past, but instead of the Lyons stool he used what was called a "shooter's walking-stick," which was very light, easily adjustable, and permitted great freedom of movement to the body. It was the best contrivance of the kind with which he was acquainted.

Mr. R. H. WOODHOUSE remarked that Mr. Coles had done his best to make every one feel uncomfortable and imagine themselves destined for an early grave, but for his own part he did not think that the disadvantages under which dental practitioners laboured were quite as serious as Mr. Coles had made them out to be. It was true that their work during the day was fatiguing, but then, unlike the majority of their medical brethren, they had the advantage of an unbroken night's rest, and as one of the rules for the maintenance of health he would suggest *early hours*. The plan of living away from one's place of business was a good one, as it entailed a certain amount of exercise in going to and fro. It was true also that they often had very disagreeable patients to deal with, and if there was any truth in the modern theory that consumption was contagious, the fact that they not unfrequently had to operate on persons affected with this disease must be held to entail a very serious risk upon the operator. There were, however, several members present who had been engaged fifty years and upwards in the practice of the profession, and who did not look much the worse for it. This seemed to indicate either that the dental was not such a very unhealthy profession after all, or if these gentlemen had discovered some means of counteracting these adverse ten-

dencies. He should be glad if they gave their fellow practitioners the benefit of their experience.

MR. DENNANT (Brighton) thought they were indebted to Mr. Coles for introducing so practical a subject for discussion, and for having thrown out many valuable suggestions with reference to the maintenance of health. He had himself suffered much from what their medical friends were learning to call "the Dentist's leg." About two years since, the pain became unbearable after standing three or four hours, resembling very much the application of scalding water to the outer part of the thigh, in the region of the external cutaneous nerve. It seemed to be due to nervous exhaustion due to the undue strain thrown upon the part. Medical advisers and common-sense suggested rest as the remedy, and this he secured by the use of the Lyons stool. He had used this for about two years with great benefit, and could now get through a day's work in comparative comfort. Having a rheumatic diathesis, he was still reminded of his weakness in damp weather, but was much better in this respect than he at one time expected he should ever be. He would strongly urge all young practitioners to learn to operate in the sitting posture and to adopt it when practicable; he only regretted that he had not done so earlier.

With reference to what had been said about the risk of operating on phthisical patients and those with offensive breath, it might be useful to describe a simple practical contrivance which had been suggested to him by a brother practitioner. It consisted of a disc of talc about 3 inches in diameter, with a hole pierced in the centre in which a light wooden stem about 2 inches long was fixed. This was held between the teeth; the mouth and nostrils of the operator were thus protected, and the comfort of the patient was also secured in those special cases where close proximity of the two faces was necessary.

MR. CHAS. TOMES remarked that Mr. Coles had enumerated a long list of points to which attention should be paid by practitioners who valued their health, but there was one point

which he had not mentioned, though it appeared to him (Mr. Tomes) a matter of some importance. He referred to the tendency most persons had to hold their breath when they were doing anything difficult. This was a bad habit, since the irregular breathing threw an increased strain upon the heart and embarrassed its action. This was a matter which was entirely within the control of the individual; it was quite easy to train oneself to breathe regularly under all circumstances, and he thought it was quite worth while to take the small amount of trouble necessary to overcome the tendency to which he had referred.

DR. ST. GEORGE ELLIOTT said it was all very well to complain of patients with bad breath, but he believed that nine out of ten dentists would be found to suffer from the same infirmity, and therefore the patients required to be considered in this respect as well as the practitioner. He attached great importance to having a good large operating room, and having it thoroughly well ventilated. He quite concurred in what had been said as to the relief afforded by sitting, but instead of a stool he had a swing seat attached to the centre of his Wilkerson operating chair. This could be pushed quite out of the way when not in use, and he found it a very convenient arrangement.

MR. W. H. COFFIN said some of the speakers had advocated working in a south light; he could only say that his father had tried this plan for two years and had greatly injured his sight by it. If it could be had, a north-west aspect was the best, and next to this a north light was the most desirable. The light might be increased, when necessary, by means of reflectors. The walls of the room should be carefully toned with some neutral tint, and the napkins also should not be of the dazzling whiteness which was generally considered proper. The feet should be kept warm by wearing thick socks and having a rug to stand on; the clothing should be light, but warm. The operator should learn to breathe regularly through the nose. By attention to such details as

these much might be done to counteract the undoubted disadvantages of a dentist's daily life.

MR. BROWNE-MASON remarked that he was in the habit of operating under a south-west light, and had not found that any harm resulted from it. It gave him the advantage of being able to work an hour longer in winter.

MR. HUTCHINSON said he thought most practitioners were of opinion that a north-west, or to speak more accurately a north-north-west, light was the best for their work. With regard to general rules for the maintenance of health, he believed the chief were, to make a good breakfast before beginning the day's work, to have free ventilation without draught, to have some light refreshment in the middle of the day, and not to go home and sit down tired to dinner, but to rest half-an-hour first. As to exercise, he knew of nothing better than the tricycle; only too much must not be attempted, especially at first. If used with discretion, it would be found to do a great deal of good.

MR. JAS. PARKINSON said that Mr. Woodhouse had called upon the senior members present to give the juniors the benefit of their experience, but although he had been in practice over fifty years, he had very little to say about the maintenance of health. He had never followed any particular rules or taken any special precautions. When he felt out of sorts he took a rest, and although he had stood over some very disagreeable mouths, he had not suffered from any infection.

MR. CHARTERS WHITE said it was all very well to suggest exercise, but he found that after he had been standing all day he had no legs to walk with, and was glad to sit down. He always stood at his work, and suffered very much at times from pains in the back in consequence. Tricycle exercise he had not tried. He tried to get a rest and some lunch in the middle of the day, but patients had a disagreeable habit of coming just at that time, saying they thought they should

find you disengaged. With regard to spittoons he found sanitas water the best thing to keep them free from smell.

MR. OAKLEY COLES said he was very pleased that his paper had elicited such a general discussion, though the point to which he had attached the greatest importance had scarcely been touched upon. His argument was that dental practitioners were not justified in ruining their health by long hours and harassing work. None of those present might have found any ill effects, at all events as yet. Unfortunately those who were so suffering were *not* present, but he could at once give the names of nine or ten men within his own circle of acquaintance who had broken down in health from this cause. And besides these there were many who suffered from constant dyspepsia and other minor ailments as the result of overwork and worry. Mr. Parkinson was a man of robust physique, and he had also the good sense, when he did not feel up to work, to give it up; but every one could not do so, and of those who could many went on working in spite of failing health. He had not concerned himself with those who were exceptionally healthy, but with the best means of conserving the forces of those who were not very strong, but who by the exercise of a little common-sense and management would be capable of doing a much larger amount of useful work than, for want of this care and forethought, they usually did do. With regard to Mr. Tomes' remarks, he fully admitted the ill effects of the habit to which he had referred, but he could not agree with him that it was easy to overcome it; at all events he had never been able to do so in his own case.

The PRESIDENT then proposed a vote of thanks to Mr. Coles, Mr. Charlesworth, and the other contributors of the evening, which was carried with applause, and announced that at the next meeting, on November 3rd, Mr. Newland Pedley would read a paper on "Fractures of the Jaw."

Mr. Turner added that he very much regretted the absence from the meeting that evening of a member who had for twenty-four years past taken an active part in the manage-

ment of the Society, and had been a constant attendant at its meetings. Mr. Coleman was about to leave England to seek a more favourable climate in New Zealand. He was sure all present would join in wishing him renewed health and vigour in his new home.

The Society then adjourned.

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